KANSAS CITY

REVIEW OF SCIENCE AND INDUSTRY,

A MONTHLY RECORD OF PROGRESS IN

SCIENCE, MECHANIC ARTS AND LITERATURE.

VOL. V. MAY, 1881. NO. 1.

GEOLOGY.

THE NIOBRARA GROUP.

BY CHAS. H. STERNBERG.

The rocks of Cretaceous No. 3, or Niobrara group, consist of an upper stratum of red, yellow or white chalk, underlaid by great beds of blue shale. There is no paleontological difference between the strata, as the same animal remains are found in both. These beds are of great value to science, as they contain the remains of animals that once inhabited the cretaceous ocean. Perfect skeletons are found of huge saurians eighty feet in length. What a field for the imagination of the student, to people the old cretaceous seas with animals restored from their buried relics! I now in imagination walk the old cretaceous beach; I hear the rush of mighty rivers, as, laden with the *debris* of the carboniferous hills, they pour into the ocean, depositing their loads of soft mud that is to cover and preserve the remains of animals living in these waters. Far out at sea, I "observe a huge snake-like animal, with head erect, full twenty feet in air, gazing into the depth below." The fish that meets his eye will soon fall a victim to his voracious appetite. Another monster of the deep grandly exposes a length of eighty feet; as he lies stretched on the waters an enemy in the distance attracts his attention and he prepares to offer battle; his four powerful paddles begin to work, and that vast mass of animal life commences slowly to move; gradually it gains more speed as the paddles move more rapidly; his huge tail, acting like a screw propeller of some steamboat, augments his speed and guides him toward his prey. The water boils behind him. It matters not how large the animal may be that he

means to attack, if once it receives a stroke from the powerful bony snout of our saurian (for he means to use it as a battering ram), it will lie a crushed and helpless mass upon the surface and the bubbling waters will suck it in; on the bottom of the ocean it will be dragged hither and thither by sharks and other rapacious fishes which will have many a dainty feast from its body. The soft mud of the ocean's bed will at last cover and bury the skeleton and preserve it for ages; future explorers will gather up and admire the finely marked bones for the attachment of muscles. A fleet of smaller saurians heave in sight; they twine their long delicate necks together or dive beneath the surface for some luckless fish, which, on again appearing, they hold in their long glistening teeth. "The air is darkened by great flying saurians that flap their leathery wings over the deep," or dive in pursuit of prey. As evening approaches they flock to the shore and suspend themselves by their claw-armed fingers to the cliffs. Wandering along the shore, I find that a huge fish, twenty feet in length has become entangled in the shifting sands of a shallow bay. It seems to be in agony, and, seeking the cause, I find it has been pierced by the long bony snout of some smaller fish that uses this weapon as the sword-fish of modern oceans does his sword. The beach is strewn with large oyster-like shells, twenty-seven inches in diameter. "They seem to be the remains of a feast of some titanic race."

As the explorer approaches the beds of the Niobrara Group, he often sees in the distance a city of imposing grandeur. Wide streets, lined with buildings of dazzling whiteness meet his eye, and only a near approach will convince him that he is looking at nature's handiwork. The rains of ages have cut and fashioned the soft limestone into the semblance of cities. The shale beds of this formation contain great quantities of the salts of soda and magnesia and the waters flowing from or through these beds are strongly impregnated with "alkali." They also contain iron pyrites and gypsum. I have often, while wandering along some wash (where the chalk and shale has been denuded), found some fossil bones scattered along, and by following them up to where bones project from bluff or bank, I find I have stumbled upon the burial ground of a denizen of the ancient cretaceous seas. Perhaps it is a species of *Leiodon* and reaches a length of eighty feet. Its long teeth glisten in the sunlight, and its powerful paddles reach far in the bluffs on either side, requiring days of toil to lay them bare. The great bony snout (the characteristic of all his race), which, with other peculiarities, places him in Cope's new sub order of *Pythonomorpha*, lies pointing heavenward. I find that he is without an expansible gullet, as in modern serpents; another method of swallowing his food whole is given him, as without it he could not exist, as he has no teeth for masticating, and I find that the jaws are provided with a set of hinges, of ball and socket pattern, just back of the dentary bone. He is thus enabled to expand the cavity of the mouth. All now that was necessary to allow the passage of large morsels into the stomach, was a loose, baggy, pelican-like throat, with which he was doubtless provided. His teeth were long and conical, slightly recurved; his head long and conical, with eyes directed upward. He, perhaps, had the faculty of flattening his head like the python.

One peculiarity of the order is found in the quadrate bones, which not only places him in the rank of reptiles, but enables the student to distinguish from it the different species. In shape this bone resembles the external ear of a man, and is composed of the bones that help make up the internal ear in mammals. This bone connects the under jaw with the skull and allows all the motion necessary. His tongue was long and forked, like a serpent's, and was thrust out while in motion. The only noise he could make was a hissing sound. While at rest, "the tongue was concealed in a sack under the windpipe." *Leiodon proriger* Cope, reached a length of eighty feet; it had a long slender neck, twenty feet in length; the tail was long and powerful, and was doubtless used both as a rudder and propeller. *Clidastes tortor* was an elegant creature, about forty feet in length; its vertebral column was provided with an additional set of articulations, so as to enable it to coil itself like a snake; this seems to be its favorite position, as I have often found it thus coiled.

Clidastes pumilus, Marsh, was a little creature, ten or fifteen feet long, and doubtless often fell a victim to the larger saurians or rapacious fishes with which the cretaceous seas abounded. The Pterodactyls of the Niobrara differed very much from those of Europe; they were much larger; I have found them with an expanse of wing of twenty-five feet; they were also without teeth, and Marsh has made the new genus *Pterodon* for them. One peculiarity of the Niobrara group is the presence of the only known birds armed with teeth.

Icthyornis dispar, Marsh, was a bird six feet in height; it was armed with long sharp teeth; the wings were poorly developed; they were swimmers and lived on fishes. Other birds are found no larger than a dove; they are arranged in families according to the position of the teeth, which are placed either in grooves or sockets. Believers in the evolution theory have received the discoveries of reptile-like birds as a positive proof that they have descended from reptiles. Of all the strange animal forms found in the rich fossiliferous beds of western Kansas, I think Cope's *Protostega gigas*, or marine tortoise, is the most unique. Cope calls them the boatmen of the cretaceous ocean.

In 1877 I discovered a specimen that measured twenty feet from one flipper to the other; the distance between the condyles of the lower jaws was eighteen inches. We know that in modern turtles the young, when first hatched, have free ribs like other animals, and that in process of growth, bone is deposited in the skin, the ribs expand and unite in connection with the breastbone, forming a perfect shell, or house. This is not the case in *Protostega*; in the adult the ribs are free, and, in place of a shell, these animals are provided with great dermal plates, two feet in diameter, an inch thick in the center and beveled off to a thin figured margin. When Prof. Cope discovered this animal, he was confident he had found a young turtle, but it was impossible to believe that an animal measuring twenty feet from flipper to flipper had just been hatched, and on studying the bones he was forced to conclude that it was a full grown animal, and to be one of those miniature types that is often found in the geological strata—another fact taken by many to prove that animals of the present day have been derived from

XUM

more imperfect species, which, by process of growth, have obtained the perfect condition in which we find them.

Great oyster-like shells are found in the Niobrara called by Conrad, *Haploscapha*. They often measure twenty-seven inches in diameter and are usually covered with small oyster shells, *ostrea congesta*. Among fishes the first resembling our common edible species are found. The species that leads them all in point of size and ferocity, is Cope's *Portheus*.

P. molossus was twenty feet in length. It was provided with a huge bulldog shaped head with fangs projecting from the mouth four inches. The roof of the mouth and lower jaws were covered with teeth irregular in size—some long and conical as the ones mentioned; others much shorter. These huge fishes were also provided with other means of defense or attack in the shape of great bony spines, with one edge enameled, that, even in their fossilized forms, are hard and sharp enough to be used in cutting wood. In some species one edge is toothed. They are often three feet in length and are made up of bundles of rods which terminate in the sharp teeth of some species, or are beveled down to make the sharp edges of others. I have no doubt but that these enormous fishes would not hesitate to attack their neighbors, the saurians. They were certainly well provided with weapons, for, in addition to the ones mentioned, their tails were forked and made up of bundles of hard bony rods, and, I imagine, a blow from this would disable an antagonist easily. Another peculiar species found in Western Kansas is the snout fish, or Cope's *Erioiethes*. Though small, not over five or six feet in length, its bony snout, six or eight inches in length, must have proved a terrible weapon. I discovered three new species, of this genus in 1877. We have also the *Enchodus*, a fish with teeth, one on each premaxilla, that were shaped like the incisors of a beaver. Sharks abounded; I have often found their flat coin-like vertebra and delicate serrate edged teeth. One species of this family are provided with teeth covering the roof and floor of the mouth, which were doubtless used as a mill for grinding up food. Some beautiful crinoids were found by Prof. Mudge's party in the rocks of this formation. A company has been organized at Trego, Kan., for the purpose of utilizing the chalk by making waterproof cement—said to be equal to the best Portland cement. Great quantities of iron pyrites and gypsum are found. The rocks are of little value for building purposes, although it has been used in making the buildings at Ft. Wallace, with the belief that they would harden when exposed to the atmosphere, but they are as soft now as when the buildings were first made. Near Wallace, however, builders can draw from the conglomerates of the Loup Fork Group, which are found on the high lands near by.

I am greatly indebted to Prof. E. D. Cope's Cretaceous Fauna, from which I have drawn largely in the preparation of this paper, as I could obtain many facts from no other source. I hope he will pardon the use of some of his descriptions.

THE ICE PROBLEM IN COLORADO.

BY CAPTAIN E. L. BERTHOUD, GOLDEN, COL.

In February, 1876, the *American Journal of Art and Sciences* published a short article on the existence of "rifts of ice in the rocks near the summit of Mt. McClellan, Colorado." In that article I have described and shown that in Mt. McClellan the whole mountain is permeated throughout with veins of ice running through the broken up rock, which is rich in veins of argentiferous galena and gray copper; that this condition extends over 500 feet in depth on the face of mountain, while immediately opposite, at about 12,400 feet above the sea, *Pinus Aristata* of large size grows thriftily. Since 1878, I have resided for several months at the north side and at the foot of Mts. Grey and McClellan and westward six miles to the summit of Loveland Pass, an altitude of 11,876 feet, but have nowhere, except at the Stevens mine, found an equal development of this icy condition.

In 1874, Prof. Weiser, in the same journal, suggested that the frozen soil and rock found by him on the west and northwest slope near and on McClellan Mountain, "were fragments of the glacial period, thus left ice-bound from their excessive altitude."

I considered this doubtful, and in the article written in 1876, I concluded that this frozen condition is more probably due to local causes, and that it is not a fragment of the glacial period. Prof. Devor introduced this subject in France at a scientific reunion, and is inclined to side with Prof. Weiser's theory. But another fact remains yet unanswered in this connection: How is it that large pine trees grow in the valley northeast from Mt. McClellan at an altitude near 12,400 feet above the sea, or 1,300 feet higher than on Grey's Peak, five miles southwest, and fully 600 feet higher than at the Loveland Pass.

In reference to this subject of tree growth on high altitudes, in 1878–79–80 I have observed in the Rocky Mountains, between Long's Peak on the north to the Sawatch range, west of the Arkansas, that whenever we arrive at from 10,400 to 11,000 feet altitude, we find that our mountain forests are composed almost wholly of *Abies douglassii* and *Abies balsamea* or balsam fir. These lofty forests of spruce and Canada balsam flourish best where the northerly slopes retain our deep winter snows the longest season in the spring; and, strange to say, the largest trees invariably are those that we find at the greatest altitude, even up to 11,800 feet, where I have measured *Abies douglassii* over five feet in diameter. In these highest forests all the trees are grown up or have passed their maturity, and have an appearance indicating a long passed period of maximum growth. We find there no new growth of young trees; the ground is covered by low whortleberry bushes, with an occasional yew or juniper bush; and in the many open glades, flowers of colors bright and lovely. The whole facies of these elevated forests breathe age and maturity that has reached and passed culmination. When destroyed by fire or the axe of the dendrophagous sawmill man, or miner, no new growth of the coniferæ take their place—they have no progeny.

XUM

Can we conjecture that originally the present lofty valleys enjoyed a climate more fitted for the growth of large forest trees, or are they the last fragment of a growth that, before the present elevation of our mountain range, flourished at lower altitudes in a better and longer period of summer months.

To better elucidate this subject, we will give a brief altitudinal catalogue of the tree growth of our Rocky Mountain range in Colorado, from 5,000 feet altitude in the South Platte valley, to the utmost limit of arboreal vegetation at 12,400 feet, in Argentine Gulch, near the Argentine Pass, 13,100 feet altitude.

LAT. 39° 45′ N.—PRAIRIE DIVISION.

From 5,000 feet altitude at South Platte river to 5,400 feet, entrance Table Mountain Cañon, on Clear Creek:

Populus monilifera,	Sweet Cottonwood,
Negundo aceroides,	Box Elder,
Salix nigra,	Black Willow.

Within two miles of the cañon we find about the last sweet cottonwood. Its place is now taken by the bitter cottonwood, or narrow-leafed cottonwood *Populus angulata*.

LAT. 39° 45′ N.—FOOT HILL DIVISION.

Altitude from 5,400 to 6,000 feet, limit of wild grapevine—*Vitis*.

TREES.

Populus angulata,	Bitter Cottonwood,
Populus tremuloides,	Quaking Asp,
Negundo aceroides,	Box Elder,
Celtis crassafolia,	Hackberry,
Juniperus communis,	Red Cedar,
Abies douglassii, (very few),	
Pinus aristata,	
Abies grandis.	

CANON DIVISION.

Latitude about 39° 44′ to 39° 38′. Altitude from 6,000 ft. to 10,000.

Pinus Aristata,	*Abies douglassii*,
Abies grandis,	*Pinus balsamea*,
Populus tremuloides,	*Populus angulata*,

Juniperus communis.

TIMBER LINE DIVISION.

From 10,000 feet to 12,400 feet.

Pinus aristata,
Pinus Engelmanni, or *Flenilis?*
Pinus balsamea, begins at 9000 feet altitude.
Abies douglassii.
Populus tremuloides, scarce.

PICKETT'S SILURIAN CAVE.

BY H. C. HOVEY.

Every one who visits Colorado is surprised at certain features of scenery to be accounted for only by considering the peculiar geological structure of the region.

The vast plains, sweeping from the Missouri Valley westward to the foot-hills of the Rocky Mountains, have a gradual upward slope from an altitude of only 770 feet above the sea, at Kansas City, to an elevation of 6,000 feet, at Colorado Springs. The underlying rocks, resting on one another, in broad sheets, are varieties of sandstone, limestone, slate and shale, mostly belonging to the cretaceous formation.

A glance at the geological map of Colorado shows that large areas of the mountain region are marked as "eruptive," which means that, at some period later than the formation of the plains, there was a great upheaval of the earth's crust, causing the lower rocks to appear at the surface, sometimes by volcanic violence, and at others by the slower process of denudation. These rocks are granite, gneiss, trap, and other hard species, capable of resisting the ordinary action of the elements.

Along the border line, between the plains and the mountains, is a comparatively narrow but highly interesting region, lying nearly north and south, where the rocks of the plains, instead of being flat, are turned upward and broken off by the same force that lifted the mountains themselves. It is the opinion of the geologists that these sedimentary beds once extended much further up the mountain side than now, being gradually worn down by the retreating waters of the primeval ocean, and the subsequent erosion by running streams.

One of my summer vacations, not long ago, was spent amid the mazes of this border land, and I found it a geological paradise, where the explorer may, by guiding his course intelligently, cross the edges of all the strata, from the Archæan rocks to the Tertiary, studying the entire history of their folding and erosion, to better advantage, perhaps, than anywhere else on the continent.

The Monument Group of red sandstones has been repeatedly described by pen and pencil. The fanciful columns of loosely cemented sandstone, each capped by a layer of tough ironstone, that are, in Monument Park, only 10 or 20 feet high, rise to lofty castellated forms in the Garden of the Gods and Glen Eyrie, some of the needle-like spires shooting 300 feet above the green meadows at their base. These grotesque pillars are produced not only by the flowing water, but by the cutting action of whirling sand blown about them by the dry winds of summer.

Frequently, instead of standing in isolated masses, the red sandstone runs in ribs parallel to the chain of adjacent hills. These ridges are cut through at intervals by arches, gateways, caves and tunnels, with very picturesque effect.

The width of this border region varies from one to twelve miles. Nearest

XUM

the Granite Hills its rocks seem to have been sufficiently modified by heat to acquire an obscure columnar structure, thus opening lines of weakness, which have been sought out by the water, aided by insinuating roots and the power of frost, until one columnar mass after another has been pried off and finally removed by the further action of the elements. This process results in a deep and narrow valley known as a cañon.

Hundreds of cañons are found in various parts of the Rocky Mountain region, some of which are of enormous dimensions. But those visited by me lie along the course of Fountain Creek, at the base of Pike's Peak, and are interesting aside from their wonderful scenery, because affording such an excellent opportunity to examine not less than 4,000 feet of sedimentary rocks. In many of them the torrent had plowed down into the underlying feldspathic granite, giving an amazing exhibition of aqueous energy.

Williams' Cañon, near Manitou, was the last one visited, and on some accounts, I found it the most interesting of all.

The mouth of this cañon is cut through the red sandstone to a limestone, at first yellowish and sandy, but improving in quality as one goes deeper into the gorge, until it is of a good quality for all purposes to which limestone is ordinarily put, and large quarries have been opened, to which a wagon road leads.

The walls rise for 400 or 500 feet on each side, in many places absolutely perpendicular, and sometimes so close to each other that both wheels of the lime carts graze the walls in passing.

I found but few fossils, and they seemed to belong to the Silurian formation; a conclusion verified by Hayden's report, which speaks of these beds as being decidedly referable to the Silurian group. Prof. Hayden adds: "I have never known of any Carboniferous fossils being found here, but am confident that there are 1,000 to 1,500 feet of these beds between the Silurian and Triassic."

On his geological map, 1876, he assigns a portion of these rocks to the Carboniferous, and also marks high ridges of Silurian limstones on the side of the mountain about four miles north.

The existence of heavy deposits of nearly homogeneous limestone under circumstances so favorable for excavation, excited my curiosity as to the existence of caves in that locality. But after following the cañon for two miles or more, toward its head, nothing of the sort presented itself, except an open gorge, to which visitors had given the name of "The Cave of the Winds."

An entrance was discovered, last June, through this very gorge to a cavern of large dimensions, named for the boys who found it, *Pickett's Cave*, and described by Rev. R. T. Cross in the *Congregational News* for March, 1881.

Some progress in underground research was made last fall by an organization known as "The Boys' Exploring Association," of which the young Picketts are members. They found numerous obstructions, but noticed in one of the rooms entered a peculiar chimney-like aperture nearly closed by dripstone.

Through this chimney a passage was forced, last January, by Messrs. Reinhart & Snyder, who now own the cave. They found at its upper end a spacious

hall about 200 feet long, decorated with a profusion of stalactitic formations, in some instances translucent, and in others varying in color from red to pure white, sometimes coated by delicate frost-work.

A canopy was observed on one side of this hall perforated by the rotary action of water, near which was a pit partly filled, on whose sides there were singular markings caused by calcareous deposit from the evaporation of water.

Crawling for thirty feet through an "auger hole," admittance was gained to a series of rooms containing many curious and beautiful objects, including a set of *musical* stalactites.

Through a deep pit they descended by means of a rope into other apartments; while to reach others still, they had to climb steep acclivities, or worm their way through passages nearly filled with *debris* or obliterated by dripstone.

Forty rooms in all have thus far been explored; and, according to the account given, the attractions increase as exploration penetrates the mountain side. Shining crystals, tufts of satiny fiber, slender arms mimicking growths of coral, rams' horns twisted and intertwined in every conceivable way, pillars and pendants, statuettes and grotesque resemblances of life, are among the charms of these enchanted halls.

Vandals have, of course, despoiled the rooms first opened, and the discoverers had a right to take a few choice specimens to be placed in college cabinets, where they could be seen by the public. But now we are pleased to see that the rules forbid any one taking specimens, or even entering unaccompanied by a guide.

It is stated that "after entering the cave it takes about two miles of travel to explore every part of it." But the proprietors are building stairways and enlarging the narrow places, so as to enable visitors to go the round without serious fatigue. They promise also to improve the wagon road to a point near the cave, and to make steps up the wall of the cañon, to facilitate the ascent of nearly 200 feet that has to be made at an angle of 40° to gain the entrance to this subterranean realm.

If Pickett's Cave is, as I infer, excavated from Silurian limstone, that itself is a remarkable circumstance; for some of the most celebrated geologists in America have recently expressed "grave doubts whether in a single case Silurian caves extend much beyond the light of day." I have, in previous articles in the *Scientific American*, referred to Hanover Cave, a mile and a half long, and Howe's Cave, three miles long—both of them Silurian caves; and now we may add Pickett's Cave, said to be two miles in length.

It must be admitted that such cases are exceptional, the rule being that most Silurian caves, at least such as I have examined, are considerably wider at their entrance than at any point within.

It also remains to be ascertained if Pickett's Cave really is in Silurian rocks, or pierces through to the Carboniferous formation, famous the world over for its cavernous structure.

Further particulars may be given as new discoveries are made. But it can

not be doubted that one more great attraction is added to the wonderful region that boasts of Monument Park, Glen Eyrie, the Garden of the Gods, Manitou Springs, Pike's Peak, and other glories all within a radius of ten miles.—*Scientific American.*

PHYSICS.

THE PHOTOPHONE EXPLAINED.

BY J. MUNRO, C. E.

The last five years have given to the world three extraordinary inventions, the telephone, the phonograph and the microphone. They are all concerned with sound, and are in reality aids to our powers of hearing. The telephone enables us to hear sounds, especially the human voice, at a great distance; the phonograph permits us to record speech directly without the use of letters, and to reproduce the original words; and by the microphone we can magnify minute sonorous tremors till they come within the range of our hearing. Moreover, they are not only allied in their uses, but in their origin, for the phonograph was suggested by the telephone, and the microphone could not have been discovered had the telephone not been first invented. To these three marvelous instruments we have now to add a fourth, which, in a still more striking manner, is the offspring of the telephone. This is the photophone or "light sounder" of Professor Graham Belland Mr. Summer Tainter.

In the speaking telephone, as is well known, the sound waves of the human voice are caused to strike upon a thin diaphragm and set it into sympathetic vibration. This vibration also acts upon an electric current, so as to vary the strength of it in a manner corresponding to the sound waves of the voice, and by leading this current along a telegraph wire and then by reversing the process so as to make it set a second diaphragm into audible vibration, we are able to transmit speech to a distant place by wire. There the electric current is simply the swift medium for conveying the sound from one place to the other, and it does so in virtue of the undulatory character impressed upon it. We might reasonably ask, then, if nothing else will do instead. A ray of light travels through the air with still greater velocity than an electric current along a wire. Are there no means whereby an undulating beam of light can carry sound? Professor Bell has shown us that there is, and taught the "golden silence" of the sunshine to laugh and sing and speak.

The suggestion of the Photophone occurred to Professor Bell in the winter of 1878, when he was lecturing at the Royal Institution. There is a substance named selenium, which is peculiarly sensitive to light, for when a ray of light

falls on it, an electric current will more readily flow through it than when it is kept wholly in the dark. If then, we make the current to flow at the same time through a telephone, the impact of the ray of light on the selenium will cause such an increase of the current as will be audible in the telephone. Again, the cutting off the light will so diminish the current as to sound the telephone, and thus, as Professor Bell remarked, it will be possible

"To hear a shadow fall
Athwart the stillness."

Moreover, the stronger the ray of light, the less is the resistance which it offers to the current, and hence it follows that an undulating beam of light will set up corresponding undulations in the current, and these in turn will generate vibrations in the telephone which may be heard aloud. Obviously, therefore, if we could devise an apparatus by which the sound waves of the voice could undulate a beam of light in sympathy with themselves, and project this beam to a distant place where it could be received on a piece of selenium, through which a current flowed on its way through a telephone, we should be able to reproduce the original voice in the receiving telephone.

At the very beginning of his attempt he encountered serious difficulties. The intractable nature of selenium baffled all his efforts. This ambiguous material, which, like phosphorus and sulphur, is neither metal nor non-metal, was accidently discovered by Berzelius, the great Swedish chemist, when he was groping for something else—tellurium—and the foundling has proved to be the more important substance of the two, for owing to its singular property of electric sensibility to light, it has been chosen from among its humbler brethren and lifted into honor.

The striking effect was eagerly investigated by a number of scientists, who all agreed in referring it to the action of light, and the yellowish-green rays of the spectrum were found by Prof. W. Grylls Adams to be the most potent to produce it. Mr. Robert Sabine demonstrated that there was a real diminution of the internal resistance of the selenium under the influence of light; but Prof. Adams also showed that the observed increase of a current flowing through the substance was not entirely due to its loss of resistance, but to the actual generation of a current in the selenium. This fact is a very important one, and will, perhaps, find its use hereafter in the transmission of optical images by electricity. For the purpose of the photophone, however, the diminution of internal resistance under light is the main consideration. Dr. Werner Siemens found the decrease to obey a definite law. It is proportional to the square root of the intensity of illumination, and upon this basis he constructed a "photometer," or measurer of light.

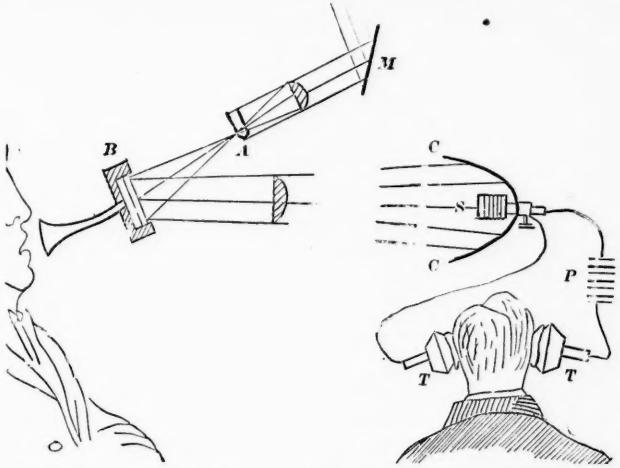
This interesting apparatus is known as the "Selenium Eye." It consists of a hollow ball of blackened wood, formed of two halves which can be opened or shut like the lids of an eye. A little within the ball is placed a glass lens to focus the light which enters by the parted lids upon a sensitive selenium cell no bigger than a wafer, fixed at the back of the ball. From this organ two fine platinum wires lead to a voltaic battery and a delicate galvanometer. The current from

XUM

the battery flows through the selenium cell and the galvanometer at once, so that when a ray of light falls on the selenium and diminishes its resistance, the current increases in strength, and the needle of the galvanometer indicates the change upon a graduated scale. The deflection on the scale thus becomes a measure of the diminution of resistance, and hence of the intensity of the ray of light. There is a wonderful, nay, fearful likeness between this curious little instrument and the human eye. The movable eye lids or shutters are present in both, as well as the crystalline lens, while the selenium cell with the conducting wires, voltaic battery, and galvanometer, are paralleled by the optic nerves and the brain. Moreover, there is another similarity which is fatal to the use of the "selenium eye" as an exact photometer. After exposure to the light repeatedly or for some length of time, the selenium cell loses its sensibility to light, and the galvanometer does not respond so strongly as before. The selenium, in fact, becomes fatigued, and, like the living eye, requires to rest ere it regains its former power. This tendency to physical fatigue was one great difficulty which Prof. Bell had to contend with in adapting selenium to the photophone. Another drawback which he had to overcome was the variable and uncertain nature of that body. Selenium occurs in two forms, the amorphous or vitreous, and the crystalline or metallic form. In the vitreous condition it is a non-conductor of electricity, in the crystalline state it is a conductor, but it has a fickle way of passing from the crystalline into the amorphous form, so that its resistance is apt to vary in an unexpected manner. Professor Bell found it best to crystallize it by annealing it in a crucible at a temperature of 210° centigrade, for 24 hours, and then allowing it to cool for 60 hours. With conductive selenium thus prepared, he constructed his photophonic cell for receiving the transmitted light.

This device combines a low resistance of the selenium with a large receptive surface. It consists of a number of round disks or "washers" of brass, about two inches in diameter, arranged side by side on axles, but separated from each other by disks of mica of slightly less diameter. These are clamped together in close file, and the grooves formed between the edges of the mica and brass are filled up with melted selenium, which is then annealed in the manner described, and the surface of the whole turned smooth in a lathe. The alternate brass discs are connected together, the first to the third and fifth, the second to the fourth and sixth, and so on, so as to give a circuit through the selenium surface, the battery and a receiving telephone. A double cell of this construction is then placed in the focus of a silvered reflector of parabolic contour, and the photophone receiver is complete.

The illustration represents this reflector, C C, with the cell, S, in the focus, and the requisite attachments of battery and telephones. The transmitting apparatus consists of a mirror, M, reflecting a beam of sunlight through a lens, and (if for the sake of experiment it is desired to cut off the heat rays) likewise through a cell, A, of alum water upon the transmitter, B. This is simply a diaphragm of thin flexible glass, silvered on the outside to reflect the light, and fitted into a frame which carries an india-rubber tube and mouth-piece, permitting a person to



speak against the back of the glass. A second lens, R, interposed in the path of the beam of light after it is reflected from the mirror, renders the rays parallel, and they travel in that condition until they are focused by the receiver, C C, upon the selenium cell, S.

In sending the photophonic message, the sound-waves of the speaker's voice put the silvered diaphragm into vibration and undulate the beam of light, which on reaching the receiver varies the resistance of the selenium in a sympathetic mode and reproduces the original voice in the telephones, T T. at the listener's ears. When sunlight is not available, the electric light may be employed, but it requires to be obtained from a very steady lamp, else the flickering will be audible in the telephone as a crackling sound which tends to drown the voice.

It is obvious that the photophone is the perfection of the heliograph, just as the telephone may be regarded as the perfection of the telegraph. But in each case the crowning instrument has a shorter range than its cruder forerunner. The telephone is dumb on the long wires which readily convey the signals of a telegraphic message, and the photophone would fail to speak over the great distances which are intelligibly bridged by the flashes of the heliograph. Nevertheless, it will be possible to photophone for a considerable distance, and even thus early Prof. Bell has succeeded in speaking along a beam of light 830 feet long.

This feat proves that the photophone will yet be employed in military tactics, and probably also in correspondence between ships at sea, or perhaps between a shipwrecked vessel and the shore. Moreover, light will penetrate water, and we can even suppose a submarine photophonic talk. The method is, of course, in its infancy, and will doubtless be perfected in course of time. Already it has realized to some extent the far-reaching truth of the poet, that "light is the voice of the stars." For the changing brightness of the photosphere produced by solar

hurricanes has revealed itself to Prof. Bell and M. Janssen in the photophone as feeble echoes, like the murmuring noise due to the flickering of the electric light.

It often happens that in pursuing one line of research a man of science is led into another; and Prof. Bell, in seeking to improve his photophone, arrived at what appears to be a new discovery of moment. It has long been known that when a bar of iron is rapidly magnetized and demagnetized, it gives out a musical note of a pitch corresponding to the number of magnetic impulses per minute; and Prof. Bell found that all kinds of diverse bodies were rendered tuneful by the impact of an intermittent beam of light. Thin disks of wood, glass, metal, ivory, india-rubber and so on, yielded a very distinct note. The apparatus he devised for these experiments is a mirror reflecting a powerful beam of light from the sun or an electric lamp, through a lens, and in the path of the beam is mounted a rotating wheel, perforated round the rim with a circle of holes. This wheel acts as a screen to the light, except when one of the holes comes opposite the track of the beam. The latter then passes on to a pair of lenses, which direct the parallel beam toward the surface of a thin disk of the material under examination. When the wheel is rotated, the intermitted beam of light falling upon the disk behind causes it to ring with a musical tone whose pitch depends on the number of flashes per minute, and the ear-tube attached enables the listener to hear it without interference. This musical photophone is in reality a light-syren, like the air-syren of Cagniard de la Tour, in which the puffs of air escaping through the holes of a revolving disk emit a note. The disk form, though advantageous, is not essential to the effect. Crystals of sulphate of copper, chips of pine, even tobacco smoke held in a glass test-tube before the beam, are found to yield a beautiful tone. Nor is it necessary that there should be light, for if the light-rays be cut off by a thin sheet of hard rubber or vulcanite, the invisible heat-rays which pass through the opaque screen are capable of producing the effect. Indeed, it is still a moot point among investigators whether the effect may not be due entirely to the vibratory expansion and contraction of bulk due to the recurring blows of the heat-rays. So distinct is the effect that the naked ear held to the disc appreciates it, and even the outer ear itself acts as a receiver, for when the intermittent beam is simply focused in the aural cavity a faint musical note is heard.

Beside their practical promise, these interesting achievements of Prof. Bell have a poetic bearing. We are at once reminded of that mystical stone of Memnon which the sunshine made harmonious, and can imagine how the chequered sunshine of trembling leaves is musical to finer ears than ours. In Dean Milman's "Martyr of Antioch" the god Phœbus-Apollo is invoked by the chorus of maidens as—

> "Lord of the speaking lyre
> That with a touch of fire
> Strik'st music which delays the charmed spheres."

And truly the deep connection between light and music is curiously exemplified in the photophone. Prof. Bell, indeed, has played the part of a god, for has he not

inspired a ray of light? Great as his invention is, however, it is probably but the stepping-stone to one still greater which is to come, namely, the transmission of light itself by means of electricity.—*London Journal of Science.*

INFLUENCE OF ALTITUDE ON CHARACTER.

R. T. VAN HORN, IN KANSAS CITY JOURNAL.

There is a theory held by many that altitude has a controlling influence on the character and proclivities of the human race, and that the highest development is to be found at the higher altitudes. However this may be, it is a fact that all the saviors of the world, the great prophets and teachers, were natives of high lands, and what is, perhaps, better still, of good climate and pure atmosphere.

For example, astronomy was born on the Chaldean plains, where there was a clear sky for most of the year, and where men slept on the roofs of houses, with the stars in sight whenever their eyes opened. Could such a science have originated amid the fogs of the Thames, or the swamps of the lacustrine regions, where noxious insects and reptiles invoked the vigilance of waking hours?

Whether these are pertinent inquiries or not, they are suggested by some curious facts disclosed by the census tables. One set of tables prepared by Dr. Gannett, gives the population of the United States by drainage basins, and the following table gives the number that live habitually at different elevations above sea level, from the shore to 100 feet and so on. It will be examined with great interest:

Height above, feet		Population. 1870	Population. 1880
0—	100	7,233,550	9,152,003
100—	500	8,653,603	10,775,250
500—	1,000	15,127,227	19,025,617
1,000—	1,500	5,620,101	7,903,811
1,500—	2,000	1,191,293	1,876,885
2,000—	3,000	360,059	664,851
3,000—	4,000	79,349	128,348
4,000—	5,000	84,319	166,545
5,000—	6,000	135,483	271,321
6,000—	7,000	58,466	94,980
7,000—	8,000	6,304	15,053
8,000—	9,000	7,390	24,947
9,000—	10,000	705	26,846
Above	10,000	522	26,400

Here we have some remarkable facts: One-fifth of the American people live less than 100 feet above the level of the sea. Another fifth at less than 500 feet, and nearly one-third below 1,000 feet, while 97 per cent. of the whole population live below 2,000 feet. Necessarily, the people living at these different altitudes follow avocations based on the products of those elevations, modified by latitude. We, here at the confluence of the Missouri and Kansas river, are about the great-

XUM

est average, 1,000 feet, and all over the continent, as a rule, these people are agricultural. Below that, and at 500 feet and less, comes what we call the planting population in Southern latitudes, and the great seafaring, mercantile and very largely, the manufacturing. At and about 2,000 feet we find the pastoral plains and the equivalent of the Arabic population of Asia, and above that the miners and delvers after the mineral wealth of the globe.

Looking at this table, then, and taking what we know of the products of the soil at these different altitudes in different latitudes, we are just what the law of our habitat makes us, an intensely agricultural and commercial people combined, and until the great interior plains and table lands are populated, we cannot be anything else. When we get 10,000,000 people above 3,000 feet, then we will develop a civilization based more upon the imagination than we can have now, and æsthetic and scientific influences will have a larger and molding effect upon the national character.

The movement of the human race within the historic period has been from the interior of the continents to the seashore. When the caravan was the means of commercial carriage, the great capitals of the world, Babylon, Nineveh, Palmyra, etc., were in the interior of the continents, but when the seas began to be traversed by improved methods of navigation, the great commercial marts were transferred to the shores of the sea, at harbors and at the mouths of great rivers, and so it has gone on until the facts disclosed by such tables as the above have become the chief features of modern civilization.

But we may date the reversal of this tendency from the discovery of steam. While it has intensified the developments to the seashore in one sense, owing to the speedy navigation of the oceans, yet it has also enabled water craft to ascend the rivers and found great cities once more in the interiors of the continents. But the radical influence in this direction has been the railway. The iron horse and his train have taken the place of the ancient caravan, and the movement of the race to the interior has begun with decided force and volume. For example, ten years ago the railroad had barely got beyond an elevation of 4,000 feet, and there were then living at that altitude and above, but 363,583 people, while to-day there are 754,449. This population has more than doubled in ten years.

This drift of the population will grow in intensity as the facilities increase and as men learn to adapt themselves to the life and industries that belong to this elevated region; when irrigation becomes fixed, organized and understood, and the riches of the mines are supplemented by the wealth of the soil, there will be developed a civilization akin in direction to that of the ancient times, and with it characteristics and qualities—physical, intellectual and moral—such as it is now impossible to realize. We will then be a completely developed nation, balanced in all respects, and less one-sided and imperfect than we are now, and more so than any nation can be without the physical geography that belongs to us. In fact, the configuration of other continents and their latitudes are not adapted to a great, diversified yet homogeneous people, and it is this fact of topography which has been one source of diversity in character, language

and social economy, and that has made of mankind hostile states and warring peoples. In the order of development this continent seems to have been reserved for a polyglot race, without entangling traditions and with a configuration that makes them one people and one great interest. Our mountain ranges throw the rivers to a common outlet, and the valleys cannot be populated by a divided people. To these the progress of science and discovery have furnished the methods of intercommunication so rapid and intimate that the health giving elevated lands of the interior can be utilized as readily as the marine coasts, and thus the race takes its return movement to the sources of its origin and in search of a development more grand than it has ever known. This is the lesson taught by these figures of the census.

GEOLOGICAL ACTION *vs.* ENGINEERING.—THE RIVER AND THE GULF.

An engineer in the service of the United States, in describing an engineering performance at the mouth of Pascagoula river, drops a few remarks in the way of casual commentary which may escape general notice, but which are nevertheless of considerable importance to the public. It was no mean engineering feat which he was describing. A light-house at Pascagoula inlet, built upon screw-piles, was threatened with destruction by the action of the sea. The screw-piles had not penetrated below what might be called the surface sand of the coast, and the shifting of these sands threatened to undermine the supports of the light-house. A new foundation was built three hundred feet distant, by driving wooden piles seventy feet long, and the building was moved on a trestle built from the old to the new supports. During the period of transfer the light was kept burning as usual, and the whole operation was marked by a rare exercise of engineering skill. But in summing up, the engineer remarks that the outlying islands along the gulf coast were evidently formerly farther out at sea, and are gradually undergoing a process of erosion and re-deposit which is removing them farther inland. In boring on the new site of his light-house he found below the surface-sands the remains of a shore marsh, with the plants in a good state of preservation, and he infers from this and other considerations that the shore of the gulf is subsiding, and that the Mississippi river is backing up. Perhaps he has other observations behind this conclusion, but his apparently incidental inference is one which it is at least worth while for the government to notice.

If the gulf coast is really undergoing a slow subsidence, the fact ought to be verified. It is undoubtedly true that the lower Mississippi is less able to discharge the water that comes down from above than formerly. The levees, which were once adequate to protect the bottoms from overflow, have now become so liable to fracture when the river is but moderately full, that little reliance is placed on them. This has been attributed to the gradual elevation of the bed of the river, and the scouring of the river bed to a greater depth is the object of the plan of

XUM

improvement adopted by the River Commission. It is held by Captain Eads and others that the elevation of the bed of the river is due to the scattering of the water in times of flood, and that the remedy consists in confining it to its legitimate channel. The spreading of the water over a wide expanse deadens the current and produces deposits of the sediment which the water bears, and the more the water is spread out the greater this deposit becomes. As the bed of the river is elevated the facility of overflow is increased, and the deposit of silt in the bed of the river is gradually increasing and the river is filling up with a constantly increasing rapidity. But if the engineer of the Pascagoula inlet is correct, the mouth of the river is gradually rising, and all the effects ascribed to a gradual elevation of the river bed may proceed from this cause. What has been supposed to be an elevation of the river bed, may be, after all, a subsidence of the river banks.

That the river has been gaining on the low lands along its banks during the period which has elapsed since those lands were occupied for agricultural purposes, is certain. Lands which were once practically exempt from inundation through the protection of slight levees are now virtually unavailable for cultivation through their almost certain liability to overflow. The theory of Captain Eads is that the river is rising above them, but the Pascagoula engineer suspects that they are sinking beneath the river. There are no old observations that we are aware of by which the level of the water in the gulf may be tested. The engineer in charge at Pascagoula inlet refers to no statistics to substantiate his opinion that the coast is subsiding, but appears to base it solely on the evidences furnished by his explorations that such a physical change is going on. That there has been a relative change between the level of the bed of the lower river and the land along its banks within the last half century is certain. What has caused this change is not so certain. Either of the two causes assigned is sufficient, and a few years of observation would decide as to the value of either. Of course the operation of either cause is very gradual. The river, if it is filling up at all, is filling up very slowly; and the land, if it is sinking, is going down very gradually. It is only by accurate observations through a series of years that the true factor of change can be detected. Whatever it may be, it can not affect the plan adopted for the improvement of the river; but if the lands which have not very far back in time risen above the waves of the Gulf are again sinking beneath them, their owners ought to know it. They are now struggling against present disaster with the hope of future prosperity, and if that hope is baseless the sooner they know it the better. They are wasting time in trying to live down the assaults of the river if their real enemy is the gulf, and the Government would do well to instruct its engineers to either verify or prove their inference.—*Globe-Democrat.*

Sir Wyville Thompson has estimated that the pressure on a man's body at a depth of 12,000 feet beneath the surface of the sea would be equal to a weight of twenty locomotives, each with a good train loaded with pig-iron.

HISTORICAL NOTES.

INCIDENTS OF EARLY TRAVELS IN MISSOURI.

JOHN P. JONES, KEYTESVILLE, MO.

The first traveler in the Mississippi Valley, who in the account of his travels, has left a claim of having ascended the Missouri river, is Baron La Hontan.* It would be more satisfactory to investigators of our early history, if full faith could be given to the Baron's recitals, but some of his statements in reference to his travels north of us, are known to be false, and it is therefore difficult to determine from the meager facts that he relates, whether or not he ever was on the Missouri. He claims to have entered the river at its mouth, on the 17th day of March, 1689, and to have reached the first village of the Missouri, on the 18th, and the second village on the next day. Three leagues from this village, he says, they reached the mouth of the Osage and encamped. After a skirmish with a body of Indians, they re-embarked and started down stream; landing his force during the night, they destroyed an Indian village and, re-embarking, reached the mouth of the river on the morning of the 25th. The next day he met some Arkansas Indians, and says, "All that I learned from them was, that the Missouris and Osages were numerous and mischievous, that their country was watered with very great rivers and, in a word, was too good for them." It is possible that what the Baron learned from these Indians was all the information he obtained concerning the Missouris and Osages and their countries.

Father James Gravier,† under date of Feb. 15th, 1694, writes of a visit made by some Illinois Indians and two Frenchmen, to the Missouris and Osages, as follows: "About the middle of May, the deputies of the Indians of this village, accompanied by two Frenchmen, set out to seek the alliance of the Missouris and Osages. These French traders, with a view of opening up a profitable trade with these tribes, have made them some proposals for peace, to which they have consented only out of considerations for the French, in consequence of which they have become reconciled with the Osages."

"I would cheerfully have made this voyage in order to see with my own eyes, whether there was anything to be done for God's glory among the Tamaroa and

* "New Voyages to North America, 1683 to 1694." Written in French by Baron La Hontan. Done into English and published at London 1703.

†One of the many zealous priests of the Society of Jesus, who lost their lives in the valley of the Mississippi. He first visited the Illinois in 1687, but returned to the Ottawa Mission the following year. In 1693 he was again among the Illinois and spent the most of his time with them until the year 1705. During that year he was dangerously wounded in a mob raised by the medicine men of the Peorias, and descending the Mississippi to Mobile, died early in the following year from the effects of his wound.

among the Kaoukia,* who are Illinois, and to sound the Missouris and the Osages, in order to see what could be expected of them for Christianity, not doubting but that I would have found many children and dying adults to baptize, but as there are libertines there who, to continue their disorderly life, do not relish the presence of the missionary, I contented myself with telling them that I would cheerfully have made the voyage with them, that its difficulties and hardships would have been agreeable to me while laboring for the interest of God. About the 25th of June, the French and Indians, who had started from here last month, to go and solicit the alliance of the Osages and the Missouris, in the hope of the great profit they were to derive from their trade, returned with two chiefs, one of each village, accompanied by several sachems and some women. Although these traders care little about teaching them to know God and the missionary in any important thing they undertake with the Indians, they have nevertheless all come to see me, and I have given them the best welcome I could. I took them to the chapel and spoke to them as though they understood me perfectly. They attended mass and were very well behaved there, like the Illinois whom they heard me instruct several times and cause to pray. They evinced to me great joy arising from the hope that I have given of my visiting them to give them sense. This is their way of speaking, but being alone I cannot assist or visit the other towns of the Illinois who are on the Mississippi river.

"The Osages and Missouris do not seem to me as bright (spiritual) as the Illinois. Their language seems to me very difficult. The former do not open their teeth and the latter speak even more from the throat than the former."

From this letter, it would seem that the Illinois traders were endeavoring to carry out La Salle's scheme of gathering the neighboring tribes around the Illinois village for the purpose of trade; but this, like other plans of the great explorer, was, to a certain extent, visionary, and only capable of a partial realization.

It is also evident from the letter, that the reverend father was now for the first time brought in contact with Indians who spoke dialects of the Dacotah language, as he remarks the guttural sounds of the Missouris and Osages, as compared with the language of the Illinois, who were of the Algonquin family.

La Harpe's Journal has the following account of a voyage to the Missouris and Osages: "Dec. 29th, 1719, M. de Bienville† received a letter from M. Dutisne,‡ of the Kaskaskias, dated Nov. 22d, 1719, containing a narrative of his voyage to the village of the Missouris by the river, and by land to the Osages and Paniouasas,§ both in 1719. He said in his letter that he had been obliged to

*Tamaroas and Cahokias—Illinois tribes who were located at that time between the Kaskaskias and the Mississippi river.

†Bienville was at Mobile at this time, from which place the affairs of the entire colony were directed.

‡Claude Charles Dutisne, a person whose entire history is a romance. He was born in Paris, and at the age of sixteen, entered the service of a company engaged in mercantile pursuits in Canada. Was commissioned an ensign at the age of seventeen for meritorious conduct in dealing with the Indians, and served with distinction as an officer in the Colony of Louisiana until his death. He was made a captain in 1721—was in command at Natches in 1722. His son was captured in Bienville's ill-managed expedition against the Chickasaws in 1736, and was burned at the stake with Vincennes, D'Artaguette, Father Senae and others. A daughter married DeGrondel, then a lieutenant, afterwards a brigadier-general in the French army.

§Pawnee.

change his plan in his first trip to the Missouris, because they were not willing to permit him to go to the Paniouasas. He had observed that from the Kaskaskias to the Missouri it was thirty-two leagues; that the waters of that river were very muddy and that it was full of obstructions of wood and rapids with strong currents; that it runs to the village of the Missouris to the north northwest, after several bends; that it is wooded by various species of trees; that one may see from it beautiful fields, vales and bluffs, at intervals; that on the west side of the Missouri, there are two rivers, the Blue—quite large, and that of the Osages, whose villages are eighty leagues above its mouth on the southwest side and which is navigable twenty leagues above this nation; that the beginning of the river is ten leagues from the Blue and forty from the mouth of the Missouri; that in the neighborhood of the Osages are very abundant mines of lead and other metallic ores, which have not yet been examined; that it is eighty leagues to the village of the Missouris by the river of that name. One league from this village, in the southwest, is a village of the Osages,* separated from the other large village of this nation, by thirty leagues. In the narration of his voyage by land to the Osages and Paniouasas, it said he had explored the Mississippi to the Saline, about two leagues from the Kaskaskias and thirty from the Missouri. According to his reckoning, it was more than an hundred and twenty leagues from the Salines to the Osages, whose village is situated on an elevation a league and a half from the river which bears their names, on the northwest side, and is composed of one hundred wigwams and two hundred warriors. This nation does not remain in its village, but like the Missouris, pass the winter in hunting the buffalo, which is common there; and there are seen the horses which they steal from the Panis. These savages are well formed, cunning and treacherous and great runners. They have several chiefs in their band who are almost absolute. There is an abundant mine of lead twelve leagues from their habitation, but they are ignorant of its use. From the Osages to the Paniouasas, forty leagues to the northwest, it is all prairie and hills covered with wild buffaloes. There are four rivers between the Osages and the Paniovasas one must cross; the largest, which is a branch of the Arkansas, is filled with rapids. This branch of the Arkansas is twelve leagues to the east of the village of the Paniouasas, which is situated by the banks of a stream, upon a hill shut in by prairie, to the southwest of which is a forest of great use to them.

"The village has one hundred and thirty cabins, of two hundred and fifty warriors. One league to the northwest on the bank of the same stream, is another of the same nation equally strong. They have together 300 horses, which they value highly and with which they will not part. This nation is not civilized, but it is easy to make them friendly by gifts. M. Dutisne adds that there were several other Panis villages to the west northwest, but they are little known. From the account of the Indians, it is fifteen days travel to the great village of the Padoucas,†; they fight each other to the death. Two days travel from the Pani-

*This village was located near the present town of Miami, Saline county, Mo. A description of an ancient earth-work near the site of this village appeared in the REVIEW for April, 1878.

†Now called Comanches. They were known among the valley tribes as Padoucahs. Their present name came from the Spanish.

ouasas to the west a quarter southwest, they have a pit of rock salt. M. Dutisne planted here the royal arms, Sep. 27th, 1719, but he ran the risk of his life, for this nation came near killing him at the instigation of Osages, who told them he only went there to make war upon them and carry them off as slaves. He proposed to them to go to the Padoucas, but they objected because they were enemies. They told him that the Mentas† were several days journey from the Osages on the southwest side."

The meager facts concerning the Osages and Pawnees given by the writer, are very acceptable, as they are the first recorded by any traveler from personal observations among them. We can but regret their paucity, as it would be interesting to know something of the manners and customs of these nations from visitors at their villages, before they had become contaminated by associating with the whites. At this time, the Osages had several villages on the Osage river, but Dutisne only gives the number of wigwams and warriors in one of them; in point of fact they were one of the most numerous tribes in the Mississippi Valley, and remained so for a hundred years.

From the text, it is hardly possible to locate the "pit of rock salt" or saline where Dutisne raised the French standard, but I am inclined to believe that it was within the present limits of the Indian Territory. From the Osages to the Pawnees, it was one hundred and twenty miles to the northwest, but only thirty-six miles across White river; this would locate the Pawnees in southeastern Kansas. Two day's travel in a southwesterly direction from the Pawnees, the pit of rock salt was located, and this distance, I think, would bring it south of the Kansas line.

De Lisle, in his map published in 1720, locates four villages of Pawnees on White river. Du Pratz, in the map accompanying his work, locates them on the same river, but nearer its source.

FORT ORLEANS. WHERE WAS IT?

G. C. BROADHEAD.

The Spaniards recognized the importance of the Missouri river, and that the establishment of a post on that river, would tend to confine the French east of the Mississippi; with this end in view they projected a plan to conquer the Missouri Indians, who then lived on the banks of the Missouri a short distance above the mouth of the Kansas river, and also to plant a colony there. The Missouri Indians were on friendly terms with the French.

We are informed that a large caravan to form a colony started from Santa Fe in 1720, and marched in pursuit of the Pawnee village, who at that time were at war with the Missouris. Being somewhat bewildered on the route, they reached, as they supposed, a Pawnee village, but which was a Missouri village. They

†One of the Arkansas tribes, and is located on early maps near the mouth of White river.

were free in expressing their designs, and therefore feeling no alarm, thinking themselves among friends, were surprised in the night by the Indians and the entire party killed excepting the priest. * This happened somewhere within the present bounds of Kansas.

This bold measure of the Spaniards awakened the French to their danger. M. De Bourgmont with a considerable force took possession of an island in the Missouri river some distance above the mouth of the Osage on which he built Ft. Orleans. M. De Bourgmont in 1724 with a few French soldiers and a large body of Indians marched northwest for some distance and met many tribes of Indians with whom he formed treaties and established peace. He set out July 3d and returned November 5th. The next year, probably, Ft. Orleans was attacked and entirely destroyed by the Indians, all the French being massacred.

Lewis & Clark locate Ft. Orleans five miles below the mouth of Grand river and say that the fort was on an island, but the island at that time (1804) was washed away. They also inform us that the Missouri Indians formerly had a village on the north side of the river opposite this island. They further state, "that the Sauks and other tribes from the Mississippi destroyed this village and killed two hundred Missouris in one battle. The small remnant took refuge with the Little Osages, others joined the Otoes.

We would ask was Ft. Orleans there situated and from whom did Lewis & Clark obtain their information?

SNIABAR.

Many strange associations have clustered around this name. And many, not knowing, believed the "Sny" hills were covered with the densest brush thickets in which dwelt men wild and fierce.

The stream known generally as Sniabar originates from many small tributaries in the southeast part of Jackson and southwest part of Lafayette extending across in an east and west direction about ten miles. The Great and Little Sniabar empty into the Missouri river just east of Wellington.

Lewis & Clark in their expedition to the Rocky Mountains in 1804 speak of passing the mouth of *Eau Beau* or Clear Water creek, where two streams enter the Missouri near each other and about fifteen miles east of Fire Prairie creek.

In Gazetteer of Missouri, by Lewis Beck, 1823, mention is made of Snybar creek, a small stream running through Lillard (former name of Jackson and Lafayette) county and gives proper spelling as *Chenal Ebert* which, translated from the French, means "Ebert's Channel," or slough.

Mitchell's (1835) map of Missouri has this stream marked C. *aux Heberts*, about the same as Beck.

Wetmore in his Gazetteer of Missouri, 1837, has it *Schuyte Aber*, and defines

* Wetmore *Gazette* of Missouri; also Annals of the West.

it thus: *Chuyte*, a German word, meaning "cut off," and relates how an old trapper named Aber came to the mouth of the stream and mistook it for a "cut off" or slough of the river and steered his boat up some distance before discovering his mistake.

Long, in his expedition to the Rocky Mountains, 1823, speaks of the Little and Great *Cheny au Barre*, and says that a hunter named *Au Barre* was formerly lost there for some time, passing up one stream and then another, mistaking them for the Missouri. From these names, whichever may have been correct, the transition is easy to Sniabar, or Snybar, still shortening to Sny.

G. C. BROADHEAD.

The monthly notices of the Royal Astronomical Society for March mention the great number of sun spots recently visible. These spots make unusual activity in the sun, and the theory is that there has been a general meteorological disturbance. The increased solar energy is believed to have licked up more than the usual quantity of water, in the southern seas, to be precipitated in our hemisphere. There have also been great magnetic disturbances, which have been attributed by some to solar influences.

BOTANY.

DARWIN ON MOVEMENT IN PLANTS.

DAVID S. JORDAN.

The purpose of Mr. Darwin's latest work is to give a detailed account of a great number of experiments on the movements of different parts of growing plants, together with a general *resume* of what is known of these movements and their causes. The accounts of the experiments are, of necessity, extremely technical, and are intended for the use of botanical investigators rather than for the general reader. The discussions and conclusions which accompany them will, however, interest every one who has the slightest curiosity in regard to the actions of "our brother organisms, the plants." These parts of the work, "to save the reader trouble," have been printed in larger type than the more technical portions.

A few of the more interesting facts developed by Mr. Darwin's investigations may be here briefly summarized. First of these must be placed the central idea of the book—that of the "circumnutation," or perpetual squirming, of the growing parts of all plants. It is known to every one that the stems of the various

twining vines wind about other objects, bending successively to all points of the compass, so that the tip revolves. Thus if the tip of such a plant at a certain time bend toward the north, it will afterward "be found gradually to bend more and more easterly, until it faces the east; and so onward to the south, then to the west, and back again to the north. If the movement had been perfectly regular, the apex would have described a circle—or, rather, as the stem is always growing upward, a circular spiral." But the figure described is always irregularly oval or elliptical, because this motion is never perfectly uniform for all sides.

This phenomenon of the revolution of the apices of plants is called by Mr. Darwin "*circumnutation*." It is shown in the present work that circumnutation is not peculiar to twining plants, but that in a greater or less degree all growing parts of every plant—the roots, branchlets and leaves—have the same motion. Moreover, the various movements of plants are nearly all simple modifications of circumnutation.

"The great sweeps made by the stems of twining plants and by the tendrils of other climbers, result from a mere increase in the amplitude of the ordinary movement of circumnutation. The position which young leaves and other organs ultimately assume is acquired by the circumnutating movement being increased in some one direction. The leaves of various plants are said to sleep at night, and it will be seen that their blades then assume a vertical position, through modified circumnutation, in order to protect their upper surfaces from being chilled through radiation. The movements of various organs to the light, or from it, are all modified forms of circumnutation—as, again, are the equally prevalent movements of stems, etc., toward the zenith and of roots toward the center of the earth. If we look, for instance, at a great Acacia-tree, we may feel assured that every one of the innumerable growing shoots is constantly describing small ellipses; as is each petiole, sub-petiole and leaflet. * * If we could look beneath the ground, and our eyes had the power of a microscope, we should see the tip of each rootlet endeavoring to sweep small ellipses or circles, as far as the pressure of the surrounding earth permitted. All this astonishing amount of movement has been going on year after year, since the time when, as a seedling, the tree first emerged from the ground."

The growth of young seedlings and the motions of the different parts of the young plants are the subjects of a majority of the experiments made. The very tip of the root is its most sensitive part, and it alone controls the direction taken by the descending axis. Wherever it goes, the growth of the root must follow; hence it is very important to the plant that from the first the root-tip should follow the best possible path. The natural direction of the root is downward, following the impulse of gravitation (*geotropism*); the tip, if the soil permits, pursuing a spiral or corkscrew-like direction downward. The root-tip, moreover, is sensitive to contact with different substances, and chooses the direction of least resistance; it is sensitive to moisture, turning generally in the direction of the greatest dampness; and to the action of light, usually turning away from it.

"Authors seem generally to look at the bending of a radicle toward the center of the earth as the direct result of gravitation, which is believed to modify the growth of the upper or lower surfaces in such a manner as to induce curvature in the proper direction. But we now know that it is the tip alone which is acted on, and this part transmits some influence to the adjoining parts, causing them to curve downward. Gravity does not appear to act in a more direct manner on a radicle than it does on any lowly organized animal, which moves away when it feels some weight or pressure.

"A radicle may be compared with a burrowing animal, such as the mole, which wishes to penetrate perpendicularly into the ground. By continually moving his head from side to side, or circumnutating, he will feel any stone or other obstacle, as well as any difference in the hardness of the soil, and he will turn from that side; if the earth is damper on one than on the other side, he will turn thitherward as a better hunting ground. Nevertheless, after each interruption, guided by a sense of gravity, he will be able to recover his downward course and to burrow to a greater depth."

In a remarkable degree, the action of the sensitive and almost sensible root-tip is analogous to that of the brain of some of the lowest animals. The circumnutation of leaves is an upward and downward motion, by which are described very narrow ellipses. The "sleep" of the leaves of certain plants—that is, the assumption of a direction at night different from that taken during the daytime—is shown by Mr. Darwin to be a modification of the motion of circumnutation. The leaves, both when awake and when asleep, are continually in motion, the motion being most rapid at the periods of transition between light and darkness. The sleeping leaves or leaflets place themselves with the axes more or less nearly vertical, some by turning upward, others by turning downward. The purpose of sleeping is conclusively shown to be the reduction of the amount of radiation of heat from the leaf—to prevent it from becoming chilled at night. The tender seed-leaves of very many plants, whose leaves do not "sleep," assume this vertical position at night. Mr. Darwin observes:

"It is impossible not to be struck with the resemblance between the foregoing movements of plants and the actions performed unconsciously by the lower animals. With plants an astonishingly small stimulus suffices; and even with allied plants one may be highly sensitive to the slightest continued pressure and another highly sensitive to a slight momentary touch. The habit of moving at certain periods is inherited by both plants and animals; and several other points of similitude have been specified. But the most striking resemblance is the localization of their sensitiveness, and the transmission of an influence from the excited part to another which consequently moves. Yet plants do not, of course, possess nerves or a central nervous system; and we may infer that with animals such structures serve only for the more complete transmission of impressions, and for the more complete intercommunication of the several parts."

This book is characterized by the same freedom from dogmatism and the

same patient attention to details which have marked all the works of the greatest naturalist of our time. A theory is worth little until it becomes a natural inference from known facts; and the best models of the investigations which furnish these facts have been given us by Mr. Darwin. Hence the superior vitality of "Darwinism" as compared with all other theories of the origin of species.—[*The Dial.*

ASTRONOMY.

ASTRONOMICAL NOTES FOR MAY, 1881.

BY W. W. ALEXANDER, KANSAS CITY.

The planets Jupiter and Saturn are in such close proximity to the sun that a favorable view of them cannot be obtained this month. As they are the most picturesque objects in this solar system, their absence causes a slight void in celestial scenery.

Venus, after the 10th, may be seen by morning observers rising a few minutes before the sun, and by the end of the month its position will be more favorable, rising at that time 1 h., 40 min. before the sun.

Mars is gradually approaching the earth and increasing in apparent "size and brilliancy," but it will be some months yet before it will be at its nearest point, and in the best position for observing; during the month it will be seen by morning observers rising on the first at 2 h., 5 min., a. m., and on the 31st at 1 h., 4 min., a. m.

Uranus will be favorably situated for observation this month, being in constellation Leo. It is visible to the naked eye when the moon is absent. Its position is east and south of Regulus, the brightest star in Leo.

The moon will partially eclipse the sun on the 27th, first contact occuring at 6 h., 42 min., p. m. The eclipse will continue from that time until sunset, the northern limb being covered by the moon in amount equal to about .1 of the entire disc of the sun.

Position of the constellation and stars on the 15th at 8 h., 30 min., p. m. Ursa Major is a few degrees north of the zenith, and Cassiopea is on the northern horizon. Castor and Pollux are visible in the northwest at a considerable altitude, and Procion in the west about an hour and a half above the horizon.

Virgo is now about an hour east of the meridian, and half way from the zenith to the horizon. It contains the bright star Spica.

Scorpius, the scorpion, is just rising in the southeast.

Coma Berenices is now exactly on the meridian, and about 10° south of the zenith. It is a group of very small stars, quite different from anything else in the heavens.

XUM

Bootes is the next constellation east of Coma Berenices. It is marked by the bright star Arcturus, which is of a reddish color.

Corona Borealis, the northern crown, is the next east of Bootes. It is composed of a pretty semi-circle of stars in the shape of a crown.

INTERESTING FACTS CONCERNING THE SUN.

Photography has proved an invaluable aid in the study of solar physics. By its help astromomers now obtain pictures of sun spots accurate in all their details, of the different phases of eclipses, and of phenomena of too short duration for the eye to fully appreciate. At the observatory of the Roman College, Rome, Italy, the late Father Secchi was accustomed to photograph the sun daily by means of an instrument invented by himself; and having carried on this operation for several years, he possessed a record of occurrences on the solar surface which has served as the basis of many important conclusions regarding our luminary. By comparing these pictures the periodicity of the spots has been determined; and from data thus obtained, astronomers have reached the belief that the sun acts not merely as a center of attraction and luminous source, but that it exercises a potent effect on magnetic phenomena.

The depth of the immense cavities forming the spots is usually about one-third the earth's diameter, and never exceeds 4 000 miles. The cavities are by no means empty, as the resistance which they offer to the passage of luminous currents show that they are filled with more or less transparent vapors. They are produced in the luminous exterior of the sun—the photosphere—and are craters therein, filled with dark vapors which cut off the light from the lower strata. They are the result of violent crises in the interior of the solar globe, which sometimes take place over large areas with great rapidity; at other times they occur quite slowly, last for a considerable period, and are seemingly intermittent in their violence. The material which composes the penumbra of the spots, and the cloudy bridges which cross or float over the dark portion, are masses of photospheric matter. These masses are the result of violent action taking place occasionally in the interior of the sun. Sometimes these actions are sudden; at others they take place slowly, and sometimes their action is renewed from time to time; and the interior trouble, of which they are but the manifestation, perseveres for a long period after their first appearances. In fact, in a great number of instances, there is a movement constantly going on, from the interior to the exterior of the sun, and this movement is shown to us by the upheaval and the projection of the luminous matter, the latter becoming visible under the form known to us as *facula*. But generally, if we study the luminous masses which are seen as spots, we find that they are comparable to vaporous clouds suspended in transparent medium. The currents and the particles of the photosphere are driven toward the center of the spots, where they dissolve and cease to be luminous. They are

often seen suspended at different heights in the solar atmosphere; and frequently the higher ones hide the lower from our view.

Solar spots are principally seen on two zones parallel to the sun's equator, one on each side of it, between 10° and 30° of latitude. The rotation of the sun was discovered by the displacement of these spots; but it is remarkable that this rotation is not similar on all points of the sun's surface. The angular speed is greater at the equator, and diminishes as the degrees of latitude augment in number. The sun does not revolve according to the laws which we suppose to govern the movements of a solid body, whence it follows that we should regard it as a mass of fluids. The sun's rotation is accomplished in a mean period of 25⅓ days; and we cannot as yet explain whether this rotation affects the solar atmosphere as well as the globe itself, for the interior regions are entirely hidden from us; but we can cite an indirect proof which has some importance, although it appears at first to be a little singular.

Herr Hornstein, discussing the magnetic phenomena observed at Prague, found in the movement of the magnetic needle a variation of which the period was 26.33 days. On comparing it with certain data, he attributed the phenomenon to the magnetic influence of the sun; and if we admit that the magnetic period above referred to is the same as that of the solar rotation, we find that the sun turns on its axis in 24.55 days. Magnetic phenomena thus give us a new idea of the period of solar rotation, which differs from that which we derived from study of the whole solar surface, but which is similar to that formed on a study of the sun's equatorial region.

Some recent studies of solar spectra in connection with sun spots and other features of the sun's envelope have led Mr. Charles S. Hastings, of the Johns Hopkins University, to form a somewhat novel theory of the sun's constitution and the conditions producing the more notable phenomena familiar to solar students.

Mr. Hastings finds, contrary to the received opinion, that the spectra of the center and the outer edge of the sun's disk are not precisely alike, though the differences are so minute as to escape all but the most perfect instruments and all methods which do not place them in close juxtaposition. Certain of the Fraunhofer lines, the thickest and darkest in the spectrum, notably those of hydrogen, magnesium and sodium, which appear with a haze on either side in the spectrum of the center of the solar disk, are sharp and distinct in the spectrum of the limb. Certain very fine lines are stronger at the limb, while other very fine lines are stronger at the center. The ordinarily accepted theory of the solar constitution and the origin of the Fraunhofer lines fails to explain these phenomena. The probable reasons for this failure Mr. Hastings discusses at considerable length in the January issue of the *American Journal of Science*, and then proceeds to frame a theory of the sun's constitution, which, he thinks, will satisfactorily explain all the observed phenomena. The limit of our space forbids more than the briefest summary of his conclusions.

XUM

His theory differs from that of Faye chiefly in localizing the phenomena of precipitation instead of regarding it as proper to all portions of the photosphere, and in supposing the precipitation confined to one or two elements. He attributes the granular appearance of the solar surface to ascending currents directed generally from the center of the sun. About these currents are necessarily currents in an opposite direction, which serve to maintain a general equilibrium in the distribution of mass. The ascending currents start from a level where the temperature is probably above the vaporizing temperature of every substance. As they move upward the vapors are cooled, mainly by expansion, until a certain element (probably of the carbon group) is precipitated. This precipitation, restricted from the nature of the action, forms the granules. The precipitated material rapidly cools, on account of its great radiating power, and forms a fog or smoke, which settles through the spaces between the granules till revolatilized below. It is this smoke which produces the general absorption at the sun's limb and the "rice grain" structure of the photosphere. The reasons for supposing the precipitated element to be of the carbon group—carbon or silicon—is simply that no other substances present the properties indicated by the cloud masses of the photosphere. It is pretty clear that the substance has a boiling point above that of iron, for iron vapor at a lower temperature exists in its immediate neighborhood. The element is not a rare one, and its molecular weight cannot be great, for though precipitated below the upper natural limit of its vapor, there are few elements found in abundance above it, and those in general of low vapor density. It is possible that the light coming from the sun is radiated from solid or liquid particles of carbon just at the point of vaporization; but Mr. Hastings is rather inclined to suspect that the photospheric material is silicon. There is also good reason to suppose, he thinks, that carbon is precipitated at a higher level, possibly along with the less common element boron.

The clouds of carbon or other smoke would naturally be drifted into spaces of downward flowing currents, thus forming sun spots, the characteristics of which are accounted for by the necessary behavior of smoke clouds sinking into regions of higher temperature. This explanation of sun spots and their allied phenomena is certainly plausible, and we shall look with interest for what older students of the sun shall have to say about it.—*Scientific News.*

A writer in the *Jewish World* points out that, contrary to the received idea, the elder Rabbins of the Talmud taught that the world was round. This is shown by a passage, in which, in discussing idolatry, the figures holding in the hand a baton, a bird, or a globe, were prohibited, because the baton symbolizes the dominion of the world, the bird that the world lies beneath it, and the globe is forbidden because it resembles the form of the world itself.

ZOOLOGY.

INSECT TRANSFORMATION.

MRS. JULIA P. BALLARD.

To those who have made insect lives a study, there is a certain fascination in watching the changes from egg to larva, from larva to pupa or chrysalis, and from chrysalis to imago, or perfect insect, which can be understood only by the lover of entomology.

The egg itself is a study. From the egg, with very few exceptions (such as some of the Aphides and Diptera), all insects originate. The eggs of insects vary in size, shape and color. Many of them are plain and smooth, and under the microscope show no greater beauty of finish than to the naked eye. Some are fluted, or grooved from a central ring, looking not unlike a fairy carriage wheel carved from pearl. Some are white, some yellow, and some a delicate green. Others, like those of the Danais Archippus butterfly, are conical and marked off in vertical lines, intersected with divisions giving them a basket-like appearance (Insect Lives, Fig. 5); and others still are biscuit-shaped and knobbed.

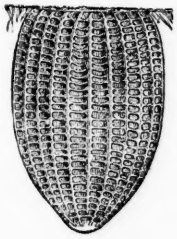


Fig. 5.

But more wonderful than the egg itself, is the fact that the different kinds of eggs are laid upon that plant, or in that locality, where the young, when hatched, will find its own particular food, or best be able to live. The Libellula, which flies on gauzy wing in the summer sunshine, always seeks the water to deposit its eggs, as the larva of the dragon fly *lives* in the water. It is a marvelous instinct which leads the Imago to remember that the element in which it sports will not support the life that first issues from its egg.

The first life, from the egg, is either in the form of larva, caterpillar or maggot. It may be more or less cylindrical, sometimes appearing to be without head or feet; or oftener having six feet. Those which have six feet are called larvæ; those without distinct head and feet, maggots, and those with six true feet and several membranous false legs, or "pro-legs," are caterpillars. The head of the caterpillar is the first of the thirteen segments into which the caterpillar is divided. The true legs are affixed to the next three segments. The pro-legs are short and muscular, larger than the true legs, and do not appear in the perfect insect.

The caterpillar, after changing its skin from three to five times, at length throws it off and assumes the pupa form. The larva varies as much in shape and color as does the egg—some being dull and without beauty, others, as that of the Danais (Fig. 7), handsome in shape, of a bright color, and ornamented with gold. Some

are suspended from the upper end of the chrysalis, like the Danais; some with a silken cord about the breast, like the Asterias, and others change without being attached from any point. Some are smooth, others have protuberances, some are notched and ringed, and some knobbed. After a longer or shorter imprisonment, the chrysalis is broken and the Imago escapes. The butterfly or moth, at first limp and helpless, soon expands its wings, and fills one with wonder that so much could be compressed in so small a space. There is no other instance, probably, of such *wonderful packing* as the case of a butterfly.

Fig. 7.

When one reads of insect transformation merely, he knows but little about the many things which combine and render perfect transformation possible. Not every egg is destined to reach the Imago. Indeed, the wonder is that so many insects reach the perfect state. If the great number of eggs which the moth lays is taken into consideration, we can readily see that, did all come to perfection, such an invasion as that of the army-worm of the present season is not only possible, but that myriads upon myriads of insects would cover the land. If, then, the entomologist is annoyed when the chrysalis he has watched for months at length develops into an ichneumon or other fly, or lies a hardened case, never to open, or gives up at last, through some injury, an imperfect butterfly, let him remember the utter inundation there would be if all the eggs should reach perfection.

I have sometimes wished, in looking at the elegant green house of the Danais, that it could remain, and not so soon have to be ruined by the issuing of the Imago. A few weeks ago (June 1880) this wish was curiously gratified. I had brought in two of the caterpillars of the Danais, [Fig. 4,] which, after eating for a day or two, suspended themselves for their change. [Fig. 6.]

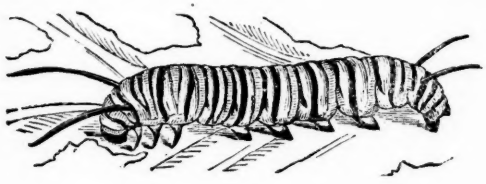


Fig. 4.

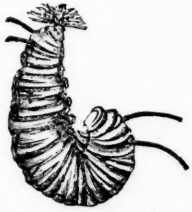


Fig. 6.

Two days after I found one of them hanging limp and dead. I held my own "inquest," and decided he had committed suicide rather than bear the confinement of his prison. The other had made his green and gold house. In a few days more I saw below the chrysalis on the box-floor a little white maggot, which changed into a brown pupa, and two others below the suspended caterpiller. At once I noticed a small hole in the side of the chrysalis, and I knew the parasitic fly had done its work. It was a case of arrested transformation and, fortunately for me, arrested at precisely that stage which allowed the escape of the intruding

fly in time to save the chrysalis; which is now, after a lapse of nearly six weeks—and which will remain—perfect in form, and although grown darker, still showing a hint of its former gold. It is far more of a prize than the perfect butterfly would have been. The little brown chrysalids have opened to disclose a fly very similar to the house-fly but some smaller.

Fig. 11.

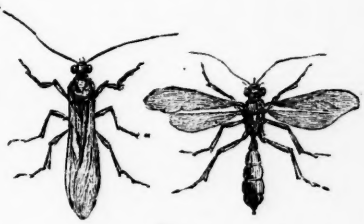


Fig. 14.

The Asterias caterpillar [Fig. 11, Insect Lives,] is often intercepted by the intruding ichneumon fly, [Fig. 14,] which steals from the yellowish-green pupa after having eaten what should have been the velvet-winged butterfly. And again I have watched the change of the spring caterpillar of the "Camberwell beauty,"

Fig. 17.

Fig. 20.

[Fig. 17,] to see its queer-shaped chrysalis opened by a bevy of several dozen tiny glittering winged ichneumons. A curious instance of imperfect transformation occurred this spring in the opening of a Polyphemus cocoon [fig. 20]. I had watched and fed the caterpillar (taken from the wood), along with two others which I had raised from the egg, (laid Sept., 1879,) and which two came out into large and perfect moths in March, 1880—and had seen it spin its cocoon. I was only repaid for the disappointment of its imperfect development by the curiosity it has afforded me for my collection. Eagerly I watched the opening of its cocoon; (being fortunate enough to see it at the first). When two feet and the head were free, it walked rapidly up the side of the box, carrying its cocoon with it. Having learned by experience, the danger and utter uselessness of aiding the exit of a moth, I watched this struggle with its adhering cocoon for hours, and at length, at intervals, for days; and all its life was lived in the cocoon,

peering out into a world of light and beauty, but clogged with a house of clay from which it was never freed.

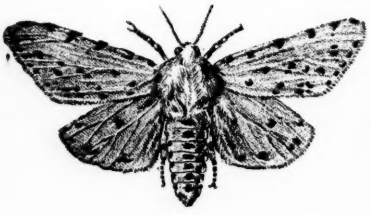


Fig. 31.

Fig. 41.

The first Acrea [Fig. 31,] which I watched escape from its prison came near sharing the same fate; only escaping by an effort which sacrified a wing.

The caterpillar of the rosy Dryocampa [Fig. 41,] seems peculiarly liable to fail in making its chrysalis, perhaps one in four dying in the attempt. That of the Io Saturnia [Fig. 44,] is so armed with spines that it is more secure from the

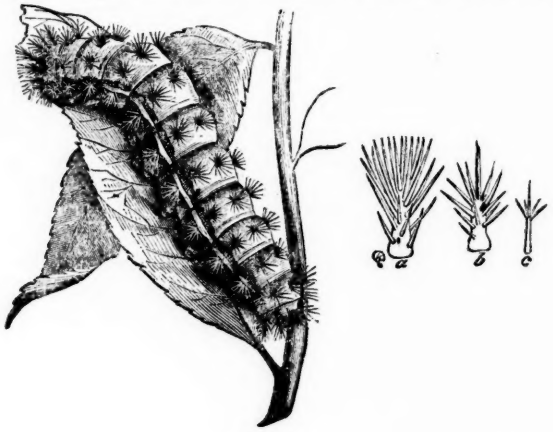


Fig. 44.

attacks of the ichneumon; while the large tomato worm may think itself happy if it escape being transformed into a traveling show by carring a score of rice-

like steeples on its devoted back. Patience, and ability to bear disappointment are necessary to the student of insect transformation, and add to the delight which follows the cases of perfect development.

MEDICINE AND HYGIENE.

ORIGIN OF SOME OF OUR ILLNESSES.

Our illnesses arise from a variety of causes, and when we consider how many agencies of evil are at work to undermine health, the wonder is that we escape disease as well as we do. Sickness of any kind is simply chemical disarrangement of bodily organs or functions, or mental disturbances which concern the brain and nerves. We live in a peculiarly constructed house, a house complicated in every part, but exceedingly well adapted to our wants. As regards the materials of the structure, there is nothing about them very stable or peculiar. Apart from the bones, the human body is nothing more than a few pounds of earthy salts and animal tissues suspended in five or six buckets of water. The bones, the only solid portion, in no respect differ from our marble wash-basins and mantels, save in the amount of phosphoric acid they contain. So far as materials go, we have nothing in our tabernacle of flesh to boast of; but the unstable molecules are arranged in a marvelous manner, and, being subject to chemical laws and changes, like all organized matter, they often change places and assume new forms in an abnormal way. If we could contrive to keep chemical and mental action always under normal conditions, we should never be ill; we should die of old age, like the perfect combustion of a candle, which dies out for the want of more wax or paraffine. Whether it was originally designed that we should never be ill—that death, barring accidents, should result from the exhaustion of old age—is a question we may discuss and consider, and never reach any positive conclusions. We find ourselves existing in a world governed by law, and from the exactions of law there is no escape. There is one law which requires us to be temperate in eating and drinking, another requires us to hold in check our passions, another demanding that we protect ourselves from changes of temperature, and that we avoid external agencies which disturb the equilibrium of chemical forces; indeed, there are many laws, the violation of any one of which causes illnesses more or less severe.

Sudden "colds," so called, originate a formidable array of illnesses, many of which terminate fatally. What is a cold? This term is one well understood, and, in a popular way, means any illness resulting from changes in the temperature of the body or any of the organs. A cold is a disturbance in the circulation; the blood is turned away from its normal circuit, the functions of the skin are suspended, the heart's action is quickened, and the temperature of the body is

XUM

elevated. The troubles are of a serious nature, if not promptly attended to. That wonderful fluid, the blood, is an important factor for good or evil in the human organization, and it is very sensitive to changes of temperature and to disturbing agents. Everything that enters the stomach, or that passes into the system through respiration or by abrasions of the skin, is urged forward into the blood, and thus sent on its way, for weal or woe, to every part of the system. If the fangs of a rattlesnake pierce through the skin at the extreme end of one of the toes, the blood is there ready to receive the poison and hurry it on toward the heart, which, as soon as reached, falters in its action, and finally stops beating. The sting of a wasp or hornet discharges into the blood a virus of much less potency, which is taken up in the same way and carried toward the heart. Slight constitutional effects, however, are experienced, and the poison expends itself in local inflamation, which soon subsides. Quick poisons are for the most part simply powerful sedatives; the action is to suspend heart pulsations, and the patient dies from syncope.

If we are brought into an atmosphere in which floats the germ of small-pox, measles, scarlatina, dipht heria, etc., the germs pass into the air-cells of the lungs, and, penetrating the cell-walls, reach the blood. The heart receives them, but is not affected as by the virus of the rattlesnake; its direct action is not influenced, and the pulsations simply drive the septic matter into the general circulation. Here is the field for the exercise of its malign influence. One germinal particle, by a process of "budding" (a property peculiar to ferments), shortly becomes a thousand, then millions, of particles, and the normal condition of the blood is seriously disturbed. Great heat is engendered, the tissues are oxidized or burned with unusual rapidity, pustular eruptions form on the skin, which are but little surface volcanoes for the escape of the poison. The effort of nature to expel offending agents from the system is something wonderful. The struggle is entirely independent of the will, for the will is usually passive in severe diseases. If the system is capable of bearing up long enough under the disturbance, health is again established, but if not the body dies.

If we pour into the stomach substances foreign to its wants, substances which resist the normal functions of digestion, like alcoholic liquids and a hundred other vile compounds, the stomach expels them from its domain as speedily as possible; they are thrust out through the door which opens into the intestinal canal, and here the absorbents take them in hand, pass them over into the blood, and from thence they travel to all parts of the system. The stomach is the most abused organ inside of a human being, and fortunately has special powers conferred upon it of withstanding abuse. It has also the capability of taking terrible revenge for violence and injustice done to it. The man himself, or the woman herself, that is, the spirit, the intelligence, which temporarily resides in the physical structure, has no business to irritate and cripple the stomach, the most important apartment of all in the house in which he or she lives. We usually say, in speaking of the body, *my* body, or our *our* bodies; but do we *own* these

structures? Do we own them, as we do farms or merchandise? Do we obtain them by purchase? No. Here is a life principle, which, in order to become developed and fitted for a higher life, must have a material machine in which to exist and act. Nature provides a perfect machine, or one as nearly perfect as circumstances perhaps require, and this is *loaned* for the time being. It is only fair that we should take the best possible care of it; but if the motive of justice is ignored, then that of selfishness comes up with its claims. The purely selfish man finds it for his best interests to take good care of his body, and when it comes to special organs he guards well the stomach from abuse.

But a kind of delirium clouds the minds of millions; the weak, the irresolute, the viciously inclined, forget or ignore all self-obligations. They drench and drown their stomachs by pouring in gallons of vile ale, beer, rum, whiskey, adulterated wines, etc., but the dread nightmare of dispepsia and delirium tremens takes terrible vengeance for this abuse. The glutton stands on no higher plane, and he must suffer as does the hard drinker.

There are illnesses which can be avoided and those which cannot be. We cannot well escape the influence of contagion in all its forms. We live in a world which abounds in unseen perils, but it is the office of education to point out sources of danger, and inform us how best to escape them. If we place on the walls of our dwellings, papers loaded with poisonous arsenical pigments, we ought to expect illness of the most serious nature, if we are readers and moderately intelligent. If we allow the waste of our dwellings to accumulate under floors, or under the windows, we ought to expect zymotic diseases to destroy ourselves or children, as science informs us that from these unclean spots arise germs which are fatal in their influence. In this age there are many illnesses which ought no longer to trouble us, as science has pointed out their source, and how to avoid them.—*Boston Journal of Chemistry.*

SANITARY ADMINISTRATION IN PARIS.

A report has been presented to the Public Works Committe of Birmingham by Mr. Till, the Borough surveyor, describing his visits to the principal continental towns. He says that in Paris every possible opportunity was given to him for the inspection of the municipal works. The following are Mr. Till's notes on the water supply, gas, paving, and sewerage of Paris:

Water Supply.—Until 1860 all water was supplied by the water company (Compagnie Générale des Eaux). In the year 1860 the city council bought up all the company's rights and assets for an annuity, during fifty years, of £46,400, payable quarterly. At the same time the said company was constituted the administrative agent of the municipality for all matters relating to the future water supply. The company receives in this capacity a commission fixed thus: On all annual receipts between £144,000 and £240,000, 25 per cent.; between £240,000 and £400,000, 20 per cent.; between £400,000 and £480,000, 10

per cent.; on all over £480,000, 5 per cent. A long and careful inquiry by a special commission has just been completed, and their report presented. The main recommendation in the report is that private consumers shall have meters, and pay according to the quantity of water used. The present system of special contracts according to rent of house is found to be unsatisfactory and exceedingly wasteful. The water supplied to the city is of two qualities; the best comes from the Seine above the city, from the Vanne, the Dhuys, and from the wells, the supply from the latter being about 30 per cent. of the total daily supply. The Seine and other river water is not filtered before being delivered. The temperature of the well water is 39° F. The second quality is from the Marne and the canals. This is used for washing and watering the streets, and for industrial purposes generally, but not for cooking or drinking. It is intended largely to increase the supply of this quality of water, mainly for sanitary purposes. The municipality pays nothing for water used for public service.

Gas.—This does not belong to the city. It is the property of a company known as the "Company for Lighting and Heating by Gas." The charge for public lamps varies with the burner used. Of these there are three sizes, consuming respectively 100, 140 and 200 liters the hour. The charge to the city is, taking these in the same order, and per hundred hours, 1s. 3d., 1s. 8d. and 2s. 6d. respectively. If supplied by meter the cost is 3s. 10½d. per 1000 cubic feet. The private consumers may agree for so much per hour per burner, or may use an approved meter. In this case the maximum price permitted by law is 7s. 9d. per 1,000 cubic feet, being double what the city pays. The same applies to gas for heating or for gas engines. The illuminating power is fixed thus: Under a pressure of three millimeters, gas burning at the rate of 115 liters per hour shall give a light equal to the light of a Carcel lamp burning per hour 42 grammes of pure colza oil (3 millimeters, 0.12 inch). Where private consumers use meters they pay rent to the company. The city does not pay rent for meters registering gas used in lighting streets, but it does pay rent for those used in municipal buildings of all kinds. The gas company may demand monthly payments in advance. The company is not allowed to demand any other guarantee from the public. Recently a new mode of showing house numbers at night has been adopted. An upright frame in the form of a triangular prism, eight inches long, is fixed against the wall over the door. On each of the two visible sides is a plate of dark-blue glass, having the number in white letters. Inside the prism is a small gas jet. The first cost of this apparatus is £4, including fixing, and the cost of the gas about 22s. per annum.

Streets.—Of the whole street area 73 per cent. is paved, 22 per cent. being macadamized, and 3 per cent. asphalted. It is intended to pave all streets where the traffic is heavy. The dimensions of paving stones have been the subject of careful inquiry and experiment, and the size finally adopted has a surface of 6¼ inches by 4 inches, and a depth of 6¼ inches. On steep gradients larger stones are used. Formerly the size was 9 inches each way. These stones were

found to get rounded at the edges and corners, and to present an uneven surface. The steam rolling of the macadamized streets is done by contract, the cost being but little less than horse rolling. The asphalt carriage ways are bedded on beton 4 inches thick, well pressed down (in very wet weather bitumen is used instead, as the beton does not set quickly), over the beton a layer of mortar, and then, at the end of five days a layer of asphalt 1½ inch thick. The annual cost of footpaths of all kinds within the city is £43,000. The cleansing and flushing of streets and removal of house refuse costs annually £160,000. Each ward has its own set of sweepers, &c. Since 1873 a special tax has been levied for sweeping footpaths; previously each household had to do that duty. There are in all 3,120 men and women employed in sweeping the streets and removing refuse. The street watering on paved streets is done from April 15 to September 30; on others from March 15 to October 15. About 22 per cent. of the area of the streets is watered by jointed pipes, and the rest by watering carts. The *first* mode is stated to cost only *about half as much*, area for area, as the *second* mode, but then the amount paid for horse hire is nearly double that in Birmingham. The watering carts belong to the municipality; the horses belong to contractors. The hydrants used for street watering are about 40 yards apart; the jointed pipes by which the water is distributed are one inch in diameter, in seven lengths of 8 feet each, on wheels, the joints being made with gutta-percha, the man with his finger on the nozzle regulating the quantity of water put on. We found in the Rue Castiglione, the carriageway whereof is 22½ yards wide, that it took the man, on an average, thirteen minutes to water only 33 yards in length of carriageway, and as each length is watered he uses a broom to sweep up the horse dung, &c. With one of our horses and carts a man can put on thirty-five loads, of 330 gallons each per day, and this quantity is sufficient to cover 82,000 square yards, or say 2,343 yards per cart load. I do not consider the hose system suitable for adoption here, except in the case of steep gradients like High street and Bull Ring, where a horse would work with difficulty. Since 1873 the house refuse has had to be placed each night in convenient boxes, in front of the houses, the contractor's carts calling for and removing the same early in the morning. The removal of this house refuse costs the city £80,000 per annum; formerly it was a source of income to the amount of £20,000 per annum. Two causes are alleged for the change: (1) deterioration in the value of the refuse, owing to the diminished use of *wood* as fuel, and increased use of coal and coke for houses and factories, and (2) increased distance of farms from the city, owing to the increase of suburban villas.

Trees in Streets and Squares.—Of these there are now about 90,000, besides 20,000 in the cemeteries. The roots of the trees planted in the streets and squares have a network of small drains for the supply of moisture. These are connected by a central drain, having a valve, and leading to the main sewer. The average cost of a tree, including transplanting, propping, draining, grid, &c., is £7, and about 90 per cent. of the transplated trees succeeded. There are three

XUM

nurseries for trees, with an area of 6½ acres. The qualities sought in such trees are (*a*) rapid growth, (*b*) shade, (*c*) non-liability to attack by insects; and the trees selected on these grounds are chestnut, elm, the western plane, lime, and maple. One hundred and fifteen men are employed attending to the trees. The seats in streets and squares number three hundred.

Sewage.—We visited the great sewer in the Rue de la Pèpinière, being met there by the officers of the municipality, detailed by order of M. Bufflers. This sewer was lighted up by means of fifty-six moderator lamps. The man in attendance showed the apparatus for pushing along sand and mud deposited on the bottom of the sewer. The sewer first inspected was of the second class. The water pipes and gas pipes are attached to the crown or sides of the sewers, thus avoiding tearing up the roadway when pipes need repairing. A truck, with paddle board moved by the current, is used to force along the sand and mud. We next visited the main sewer, or collector of all sewage coming from the right bank of the Seine. The mean velocity in the collector was 165 feet per minute. The sewers received (1) large portions of street sweepings; (2) storm water; (3) water thrown out from houses; (4) contents of water closets; (5) urine from closets fitted with double cylinder. From five hundred to six hundred men are employed in the sewers, of whom thirty-two work in the great collector. The length of this main sewer is seven and a half miles, the length of main on the left bank of river, five miles, and the total length of sewers in the city is five hundred miles. The daily outfall of all sewers is 300,000 cubic meters, or 66,000,000 gallons.—*Van Nostrand's Eng. Magazine.*

MINERALOGY AND METALLURGY.

THE MINES OF MEXICO.

Some years ago I went from White Pine to Mexico. As I passed Eureka (or where it now stands), Stetefeldt told me to stay, since Eureka would be the big camp of the coast. His prediction has been amply verified. My first visit to Mexico lasted five years and three months. I served as superintendent of three of the large mines (mentioned by Ward and Humboldt); I visited some of the celebrated old mining districts; and so was enabled to form something of an opinion.

The first idea of the *gringos*, or Americans in Mexico, is annexation to the United States. They are constantly urging it, and often make much trouble for themselves thereby. Our people are energetic, and rush ahead; but in so doing, they respect the rights of no one. They damn the country, the religion, the "grub," the law and the climate—everything.

The Mexicans do not forget the lesson taught them in California in 1849 and 1850. They well remember how they were rooted out of California, Arizona,

New Mexico, Colorado, Utah, Nevada, etc., and the Texan war is still fresh in their memories. They now number 10,000,000 of people, and it will not be an easy thing to annex them. They are well armed and will fight. So I think that the chances of annexation (under a Republican or Northern administration) will be small. If a Southern administration were in power, there would be a war with Mexico without doubt.

As to climate, there are three kinds: the hot country, the temperate, and the cold. The first is from the sea-level to 1500 feet above the sea; the second, or *templada*, from 1500 to 4000 feet above the sea; and the last from 4000 to 8000 or more feet above the sea.

Calenturas, or chills and fevers, are very common among the foreigners. Still, there are some very healthy natives—but of the chocolate-colored race. Our North American new-comers will suffer much from malaria; but in time they, or their children, will be acclimated.

The food one soon learns to relish. I often wish for a *cazuela de frijoles* and some *tortillas*, etc.

In manners the Mexicans are a kind-hearted people, and very polite in all the relations of life. This politeness extends to all classes.

As to mining, they have worked their mines for three hundred years, or thereabouts; we have worked ours only twenty; and yet we are far ahead of them in present annual product. This does not show that we have better mines. They can show a Valenciana for our Comstock, a Sombrerete and Zacatecas, Real del Monte and San Luis Potosi, Batopilas, Candelaria, Botaños, and Guadalupe de los Reyes for our Eureka, Tuscarora, Austin, Leadville, Ontario, Homestake, Tombstone and Bodie.

Our people must have some new excitement to rush to every spring. This time it is apparently going to be Mexico. No doubt, in some respects, the railroads will effect a wonderful change in Mexican conditions. What the result will be no one can tell. But I can safely say that there are good mines more easily accessible in our own country, and that many of our American companies in Mexico will be badly "cinched."

There are many points to be learned from the Mexicans in mining. They work their ores very closely—much more so than we do ours. But their processes require several stops and a long time. In the mines they work with few tools and appliances, and yet are very effective miners, using especially very little timber. The grand difficulty in Mexico is in getting around the mountains. The trails are frightfully bad. Railroads will run through the country, but will not benefit all the mining districts.

In 1824, the English made a grand rush into Mexico. Of the scores of companies not one remains—they all went under. The same thing occurred in 1864, when a rush took place from California. The disasters of those two periods will pretty certainly in many instances be repeated. In short, the Mexican boom,

XUM

like all the other mining booms, will wreck a good many adventurers, and carry a few to fortune.

In my next, I may give some descriptions of English and American enterprises.—*Cor. Eng. and Mining Journal.*

THE SAN JUAN REGION, COLORADO.

BY THEO. B. COMSTOCK.

San Juan County has had less snow than last year; but avalanches have been perhaps more frequent, though but little destructive. If late snows do not come, the season will open quite early. Not a few who have wintered in the East have already returned. The Denver & Rio Grande Railroad has been vigorously pushed, and it will very soon be completed to Durango, from which point it will be quickly extended to Silverton. Meanwhile, comfortable coaches will daily cover the intervening distance. The Upper Animas Valley, as far as the Animas Forks, will be provided next season with as good facilities for travel as last year, or better. Freight transportation must become much cheaper and more easily procurable than ever before, while the increased facilities for ore-reduction will undoubtedly give better prices and enable lower grades to be profitably treated.

There has been much less than the usual amount of "wild-cat" organization of San Juan companies here in the East this season, though one or two have slipped in unnoticed with the large number of good incorporations. Boston capitalists, with characteristic forethought and judgment, sent out some competent investigators last season, and the result of their labor is now apparent in at least some of the new enterprises brought to public notice in that city. Still, I feel it necessary to warn investors that not every one of these schemes is worthy of full support. Good companies will not suffer from my hint that high capitalization and stock speculation have already injured the San Juan country more than the failure of any business enterprise. In fact, it may be truly said that there have been no failures in San Juan; for in every instance of disaster, the fault has been with manipulators in the East. The mines are still there, ready to justify all that was ever predicted by competent authority.

The production of this district last year was actually less, by the records, than in 1879; but the work performed, the development of the mines, and the ore taken out were much greater; for we were placed in circumstances such as can never again occur, which gave us no tempting market.

Silverton has received new impetus from the forming of companies to work the mines in Cement and Poughkeepsie and other gulches, and good reports have been received from reliable sources of the work done this winter upon the productive veins in the neighborhood.

Arrastra and Cunningham gulches are not behind, and all at Eureka are more than ever convinced of the great value of the local fissures. There is now a very strong probability of important additions to the working facilities at this point,

by means of which a large amount of low-grade ore will be marketed at an early date. The Niagara Consolidated Company is making preparations for vigorous prosecution of development work upon its large bodies of rich ore, and there is now an assurance that it will take its place among the large dividend-payers.

Above Eureka, the new smelter near Burns's Gulch will have an opportunity to prove its worth ere the completion of the railroad and the competition at Durango give it the severest test of its ability to hold its own against such odds. It certainly has the best wishes of all in the upper valley at least, and its managers deserve well of the neighborhood for their energy and determination.

The Tom Moore Mining Company is one of the kind that reserves all its noise to the last; but one of these days its stockholders will be shouting for it in a body, because of the present economy of management and the dividends which this policy and the worth of the mines will eventually produce.

Animas Forks is flourishing, and the rich mines in the vicinity of Mineral Point, notably the Red Cloud, are behaving nobly, fully justifying the hope that has been placed in them.

I am not an authority upon Rico and Ouray in detail; but the true story that reaches me through letters and statements of the most trustworthy character, as well as from Lake City and other more familiar localities, may be briefly indicated by an article in my own creed, namely, "I believe in Eureka, and in San Juan County;" but what I say of these, in general terms, applies equally to all parts of the great San Juan country, than which there is certainly no greater mineral territory in the world. The proofs will be forthcoming as the years roll by, and long after this generation shall have passed away.—*Mining and Engineering Journal.*

DIFFERENT VARIETIES OF STEEL.

The following correct definitions of the different varieties of steel by William Metcalf, of the Crescent Steel Works, Pittsburg, Pa., are published in a circular by the Dexter Spring Company of Hulton, Pa.:

"This definition still applies, but in addition the term cast steel applies to all of the products of the crucible, the Bessemer converter and the open hearth furnace, whether such products are too low in carbon to harden or not. The steels that are not cast steel are known in the market as blister steel, German steel, shear steel and double shear steel.

"Blister steel is made by heating bars of wrought iron, bedded in charcoal, in hermetically sealed chambers. The carbon of the charcoal penetrates the hot iron, converting it into a crystalline mass of crude steel; large blisters rise on the surfaces of the bars, giving the name blister steel to this product.

"Originally the word steel was applied only to iron which contained such quantities of carbon as would cause hardening when the red hot iron was cooled suddenly.

"German steel is blister steel rolled down into bars. It is used mainly for tires and common springs, and is being rapidly superseded by the cheaper grades of cast steel.

"Shear steel is made by taking a high heat on blister steel and hammering it thoroughly. Double shear steel is made by cutting up shear steel, piling it, heating it and then hammering again. The best shear steal must be made from the best wrought iron. The shear steels are very useful on account of their toughness, and the ease with which they can be welded to iron, and when of good quality and well worked, they will hold a very fine edge.

"Crucible steel is made by melting in a crucible either blister steel or blister and wrought iron, or wrought iron and charcoal, or wrought iron and scrap steel; or, in short, a great variety of mixtures, which depend upon the quality of steel to be produced.

"Crucible steel can be applied to any purpose for which steel is used. Generally. it is better than any other steel—that is to say, crucible steel made by melting blister steel, and tempered to suit by mixing iron of the same grade in the crucible, is always better than German or shear steel made from the same blister.

"Bessemer steel is made by blowing air through melted cast iron, thus burning silicon and carbon out of the cast iron. After the silicon and carbon are burned out, melted spiegeleisen, or ferro-manganese, is added to the charge. The carbon in the spiegel recarbonizes the steel to the desired point, and the manganese unites with and removes the oxygen which the air used leaves in the steel.

"Open-hearth steel is made by melting, in a very hot furnace, a charge of pig iron; to this melted iron, which is called the "bath," is added, either wrought iron or scrap steel or iron ore, and the whole is kept hot until all is melted. The wrought iron, or scrap, or ore, reduce the carbon and silicon in the bath to such proportions as are desired in the steel.

"Bessemer and open-hearth steel are much alike in quality. They are used mainly for rails, boiler plates, ship plates, bridge and other structural purposes, and machinery. The better qualities are also used largely for springs. The best spring steel, like the best tool steel, is simply that which is made from the best material. Quality of material, chemically speaking, being equal, the best spring steel is that which is made from crucible cast steel, as the crucible process is less crude than either of the others.—*Age of Steel.*

ARIZONA COAL.

Allusion has heretofore been made to the discovery of large and valuable deposits of coal in Arizona. The location of the fields is near Saddle Mountain, twenty miles northeast of the junction of the Gila and San Pedro rivers, on the upper waters of Deer Creek. Some weeks ago a man brought in specimens of

coal, some of which he had used in a blacksmith forge in sharpening tools. A party was fitted out, who prospected the country, and after a week's search a much larger body of coal was discovered than was first reported. Speaking of this, the *Scientific Press* says: "This latter showed croppings, float and shale, in the easterly end of a valley about twelve miles in length, and all the ground in the vicinity with coal on the surface had been occupied when the second party reached the valley. They, however, followed down the same, occasionally finding evidences of the presence of coal, till near the southwestern end of the valley they found hundreds of acres literally covered with coal croppings. Where the waters, rushing down a wide cañon, had cut a wash-out of twenty feet in depth, they found the black walls reaching from the bottom to the top, while the floor of the wash was not still through the deposit. An examination of the location discloses what would appear at a cursory glance to be thirty ledges, all dipping into the hill to the southeast at an angle of twenty degrees, but which are doubtless only one or two, the surface being marked somewhat with the *debris* from the tall hills on that side. This party, with a few others who joined them in the valley, located 1,240 acres. In a few days the valley was full of prospectors making locations, and now nearly the entire valley between the two original discoveries is taken up and occupied.

"Specimens from the southwestern discovery were brought to San Francisco a few days ago and have been tested. It is a fine quality of semi-bituminous coal, generates gas well and cokes beautifully. It is free from impurities and deleterious matter, and is pronounced by competent judges to be the best article or quality of coal for this country. This coal field is not more than twenty-five miles from the point where the extensive copper smelters are soon to be erected by Mr. W. A. Ballinger, and will supplement the smelting industry southeast of Globe, now bidding fair to be very large and extensive. A competent engineer estimates the cost of constructing a railroad up Deer Creek to the mines at $10,000 per mile. Unquestionably this is a most valuable discovery, and will satisfy a need long and seriously felt in Arizona."

METEOROLOGY.

KANSAS WEATHER SERVICE OBSERVATIONS AT WASHBURN COLLEGE, TOPEKA.—MARCH 20, TO APRIL 20, 1881.

BY PROF. J. T. LOVEWELL.

The last eleven days of March, which are included in this report were warmer than the first part of March, the sky much of the time being clear, and air very dry with no rain. The first week in April was very cold for the season, the

minimum temperature on the 9th being 47°. From this time, the 7th, to the 20, there have several slight showers, the most abundant being that of the 20th. On the 16th the temperature rose to 82°. The prevailing winds have been northwest and north. The total rainfall, 0.435 inches, is even less than that recorded last month; but this record closes with a rain storm in progress, which may betoken the beginning of our spring rains. This is nearly a month earlier than they began last year, and the wheat which had begun to suffer will be greatly benefited thereby. The first dog-tooth violets (*erythronium albidum*) were seen here April 9th. Elms and maples began to blossom about the same time, and cottonwoods a few days later; redbuds did not begin to open till the 20th. There was a slight snow squall on the 12th, and the night following the temperature sank to 16°. The wind has continued mostly from the north and northwest, and the highest velocity recorded was 58 miles per hour on April 1st.

The following summary by decades represents the averages as determined from our tri-daily observations:

Highest barometer, 29.27 on the 26th of March.
Lowest barometer, 28.50 on the 7th of April.
Highest temperature, 83° F. on the 17th of April.
Lowest temperature, 7° F. on the 4th of April.

	Mar. 20th to 31st.	Apr. 1st to 10th.	Apr. 10th to 20th	Mean.
TEMPERATURE OF THE AIR.				
MIN. AND MAX. AVERAGES.				
Min.	29 0	20.6	38.5	39.4
Max.	57.3	48.0	68.8	58.0
Min. and Max	43.2	34.3	53.6	43.7
Range.	28 4	27.4	30.3	28.7
TRI-DAILY OBSERVATIONS.				
7 a. m.	33.2	30.0	44.8	36.0
2 p. m.	50.0	43.3	63.7	52.3
9 p. m.	38.0	36.5	50.5	41.7
Mean	39.5	36.6	52.7	42.9
RELATIVE HUMIDITY.				
7 a. m.	.82	.85	.78	.82
2 p. m.	.58	.70	.56	.61
9 p. m.	.75	.82	.78	.78
Mean	.72	.79	.71	.74
PRESSURE AS OBSERVED.				
7 a. m.	28.94	28.99	28 88	28.94
2 p. m	28.94	28.94	28.83	28.90
9 p. m.	28 95	29.05	28.88	28.96
Mean	28.94	28.99	28.86	28.93
MILES PER HOUR OF WIND.				
7 a m.	13.8	18.1	11.3	14.4
2 p. m	27.6	19.7	18.4	21.9
9 p. m	13 0	17.5	10.4	13.6
Total miles.	4635	4333	3178	12146
CLOUDING BY TENTHS.				
7 a. m.	2.3	7.0	5.5	5.3
2 p. m.	3.0	5.5	5.5	4.6
9 p. m.	2.5	4.7	5.2	4.1
RAIN.				
Inches	0.00	0.035	0.40	0.435

CORRESPONDENCE.

SCIENCE LETTER FROM PARIS.

PARIS, March 12.

Periodically the trichina disease is notified as existing in the country; the fact is, the malady is as old as the hills, only within the last forty years it has received a new name. Its effects have been less baneful in France than in Germany, Italy or Switzerland, because, in this country, pork is more thoroughly cooked and the parasites thereby destroyed. Where illness or death has followed the consumption of trichinous pork, the latter invariably turned out to have been imperfectly cooked. The Germans, in 1840, called the disease *Schinkengift*, or ham poison, and *Wurstgift*, or sausage poison. The poison was simply trichinæ, discovered in 1835 by Ouen, and more popularly made known by Virchow. It was in 1851 that the public became alarmed, in consequence of several persons having died in the neighborhood of Hamburg after eating ham. In 1863, M. Langenbeck, of Berlin, while performing an operation—the removal of a tumor—discovered the patient's flesh to be alive with the animalcules: on being questioned, the patient admitted that he had been served with poisoned pork by an inn keeper, who, to avoid prosecution, had fled to America, perfectly unconscious of having committed any crime. The real criminal was the trichina. The latter is a worm, and can be found in man, cats, crows, vultures, rats, mice and moles, as well as in the pig. It exists in a little bladder-like vessel called a cyst, in the muscles, and by that channel is absorbed by us, resembling little white corpuscules, or pimples; magnified to 300 times its size, it resembles a small worm coiled up on itself. In the cyst the worm remains inert, but once in the intestinal canal, it becomes animated. The female is viviparous, and lays more than 1,000 embryos at a time, and can continue doing so during seven or eight weeks; these embryos, by their very smallness—for they have no perforating organs—pass through the membrane of the intestine, enter everywhere—into the very blood itself. When the worm finds a muscle suitable it develops itself rapidly, taking, after nineteen days, the form of larva. Here its role—its existence, ends; it forms a cyst at the expense of the muscle. The worm dies and passes off with other matters by the intestines. The diseased muscle, if eaten by an animal, will in due time yield up its worm, liberated by the gastric juice of the stomach, and so recommence its role of propagation. The intensity of the symptoms of the disease varies with the temperament of the individual, and the number of trichinæ absorbed; three days suffice for the incubation of the latter, when the patient commences to lose appetite, to feel vaguely out of sorts, to experience nausea and an ardent thirst; the lassitude increases, the features become swollen, and, as the animalcules emigrate among the muscles, the pain

becomes more acute; if they lodge in the respiratory muscles, breathing will be affected. Feebleness and exhaustion duly set in, and after six or eight weeks of suffering, the patient succumbs. In every country the trichina disease has produced victims. American pork is largely blamed as the chief cause, so that Italy, etc., refuses to admit importations of that meat. Prussia has a battalion of 18,000 inspectors to examine the pork, and despite that sanitary army they cannot prevent diseased meat from passing the frontier into France. At the abattoir here, it takes an inspector with the microscope at least fifteen minutes to examine the diaphragm—the most general seat of the disease—of a pig. It would require, then, a large army to control the 23,000 tons of pork sold by 1,000 pork butchers in Paris alone, the control being rendered more difficult where the meat has been cut up or salted. As many as one trichinous American ham, in ten, has been imported into Europe, and Messrs. Belfield and Attwood have discovered 13,000 of the worms in a cubic inch of ham. It is a serious step to prohibit the importation of American pork into France, as it forms, by its cheapness, the basis of the poor's animal diet. The law, however, holds pork butchers responsible for the consequences of selling diseased meat. So it is proposed to instruct them in the use of the microscope, as in Germany, to detect trichinæ themselves. In the meantime, the public is urged to give at least a good twenty minutes boiling to every pound of pork in the pot.

It is very common to give to soap a name recalling the sap of the plant presumed to enter into its composition. Thus there are lettuce, marshmallow and iris soaps, perfectly innocent of all connection with these plants. Lettuce is presumed to impart a green color to soap, though every one is aware its juice is white. The colorings of soap are intended merely to recall—by an appeal to the eye—their perfumes. Thus, rose presumes roses; violet, violets; and yellow, orange. It is aniline, whose raw material is coal tar, which supplies at present industry with nearly all its coloring ingredients. Before being employed for the preparation of soaps, the aniline dyes are first dissolved in glycerine. The juice of lettuce, which is white, is extracted when the plant is coming into flower, and is used, not for imparting a green hue to soap, but for preparing thridace—from the Greek *thridax*, lettuce—and the active principle of that substance, lactucarium, much used in medicine. It is sesquioxide of chrome that imparts the various colors to soaps, to tissues, to porcelain, glass, paintings, etc. When the oxide is combined with a certain quantity of water—known as in the hydrate state—it produces the most permanent, beautiful and unalterable greens, which are not poisonous like those from arsenic; it exists in the soap as an impalpable powder. Marshmallow soap is a combination of tallow and palm oil, but has not a trace of marshmallow; the same as bitter almonds soap is perfumed with nitrobenzine—not extract of with almonds. The "economical" soaps generally contain from 25 to 30 per cent. of earthy or primaceous matters. A good soap ought not to contain much water, as an excess destroys the perfumes; it ought to be completely deprived of free alkali, so as not to affect the skin; the alkali in

the case of soft soap, is potash; and for hard, soda; soap should be exempt from too much unsaponified fat, in order not to leave the hands pitchy; the water, if calcareous, will cause the soap to curdle or waste, and such will continue till the soap has saturated all the lime in the water.

The discussion is still continued in scientific circles as to what constitutes the surest indications of death. The rigidity of the remains, say the majority, although that has set in before the extinction of life. The flexibility of the members is a proof of the absence of death; but such can exist along with death. Bichat maintained, that in the case of the asphyxiated, no stiffness of the body is found, and Hunter asserted that such was absent in the case of death from lightning; a fœtus does not become rigid after death, according to many. However, rigidity is a phenomenon very constant after every form of death, and observed alike with verterbrate and invertebrate animals. Though this stiffness be peculiar to the muscles, other tissues, as the brain, the liver, the kidneys, present a rigidity analogous, while less marked. The rigidity is presumed to be due to the coagulation of the albuminoid matters which enter into their constitution. What is the difference between congelation and rigidity? A muscle in the latter condition has still a certain degree of elasticity, but a frozen muscle is hard as metal, and, when struck, sounds; when pressed, emits the cracking noise peculiar to tin. When does rigidity set in? The moment is very variable; immediately after death in some cases, and later in others. Sardines and whitebait become rigid immediately after asphyxiation. There is a close connection between this stiffness and muscular irritability. All muscle separated from the nutritive action of liquid blood passes through three stages; increase of excitability, decrease of same, rigidity and putrefaction. The stiffness is presumed to commence by the trunk and neck, next the thoracic membranes, and afterward the abdomen. The muscles of the jaw, according to some authorities, are the first affected. Upward of twenty-seven per cent of corpses become rigid within four hours, and twenty per cent within six hours. The turning in of the thumb against the palm of the hand, to be covered by the fingers, is not always a sign of death. There is a rigidity, a kind of catalepsy, peculiar to battlefields; thus a soldier has been found dead and stiff, one hand holding the bridle of his horse, the other his carabine, one foot in the stirrup and the other on the ground; another soldier, whose head had been carried off by a shell, held firmly in his hand a goblet full of water that he was in the act of drinking. These phenomena can be reproduced by killing rabbits. A sardine expires instantaneously when removed from the water, but a conger will live for a long time; birds become stiff sooner than rabbits, and the latter more rapidly than dogs. The influence of heat is an important point. Cold is declared to hasten rigidity; but an animal may be rigid and yet warm, as is illustrated in shooting game. Further, the cooling of a dead body proceeds slowly, often taking twenty-four hours to equal that of the surrounding air, because chemical changes take place a long time after life. In the case of deceases from cholera, madness and lockjaw, the body actually becomes warmer by two

or three degrees pending a space of four hours. There is, then, no connection between cadaverous frigidity and rigidity. In cold weather a dog will remain eight days stiff after death, while in summer it will hardly become rigid. Instance can be adduced where, in typhus fever, cadaverous rigidity set in though the pulse beat for three minutes later. Hares, when run down, are found with their legs rigid, and life not departed. Butchers always allow stock that have been driven from a distance to repose a few days before being slaughtered, as, if instantly killed, rigidity would set in at once, but later—due to the chemical action taking place in the muscles—that stiffness would disappear, and putrefaction prematurely arrive. This is the reason why in La Plata, when troops of cattle are destined to be killed for the European market, they are ever allowed several days of repose before entering the abattoir. In the case of animals poisoned by strychnine, their arterial blood is ever found to be black; rich in carbonic acid and poor in oxygen. It is by provoking asphyxia that electricity destroys life; a frog, however, can be charged with electricity for hours and be in no way affected, simply because frogs cannot be suffocated. When a muscle works, it becomes acid; perhaps this acidity contributes to cadaverous stiffness, although Claude Bernard has found the muscles of crayfish alkaline after death. Paralyzed muscles become sooner rigid after death than the others, but neither age, sex, nor physique modifies rigidity. On the whole, we know nothing certain of the causes which determine rigidity. Winslow, 'tis true, doubted that any certain signs existed of death; however, the presence or absence of rigidity, even when all other evidence is wanting, will indicate when death is definite. No confusion must take place between tetanic and cadaverous rigidity; in the former, when the stethoscope is applied to the muscle, the ear recognises a certain rustling; in the latter, absolute silence. In the case of catalepsy, the muscle, when acted upon by electricity, will contract; in the dead muscle no excitability will ensue. For juridical purposes, if a body be completely rigid, death may be set down as having taken place within two hours, and not extending beyond forty-eight, or in winter sixty. A corpse may be supple—proof that rigidity has disappeared, and which may occur in periods of great heat or deaths caused by lightning. The death of a muscle, then, is characterized by rigidity, which, till then, retained its irritability or life; the disappearance of that rigidity is caused by the forming acids dissolving the coagulated or stiffening matter of the muscles, thereby producing ammonia—the characteristic of incipient putrefaction. Cadaverous stiffness, then, belongs to the chemical order of phenomena.

A new method of reproducing photographs in colors on china will, it is predicted, completely revolutionize that art. By the new process a dinner plate can be converted into a veritable work of art at a slight expense—not one twentieth of the cost by the plan of hand-painting.

SCIENTIFIC MISCELLANY.

SCIENCE IN REVELATION.

BY REV. JAMES FRENCH.

The quadrature of the circle, according to the Legendre modulus, is a mathematical problem which Archimedes worked at ineffectually; but which was supposed to have been solved first by Ludolf Van Keulen, of Holland, A.D. 1590. He was so elated over his discovery, that he had the figures expressing the symbol of it engraved on his tombstone as his memorial. The proportion of the diameter to the circumference of a circle is the all-important factor in solving this problem. The knowledge of this is so essential to advance mathematical science and mechanic art, that it has received a name and a sign. Just as, for convenience, multiplication is symbolized by a cross (×), and equality by two parallel lines (=), so is this proportion (1 : 3.14159+) represented by the Greek letter pî.

But Ludolf Van Keulen never did discover this proportion to exactness, nor even the true scientific method of solving the problem. He approached as near to it as any other mathematician known to us. But all he really did was to square the many-sided polygon, contending that the quadrature of a circle was an impossibility, like the meeting of two parallel lines. It has remained for the late John A. Parker, of New York, to discover this real mathematical proportion, which, for convenience, we will designate in this article as English (or "Brit"-ish P.) (P.) to distinguish it from Greek pî. And J. Ralston Skinner, of Cincinnati has discovered that the Parker formula was the identical one used by the architect of the Great Pyramid in its construction, and also by Moses and Solomon in the construction of the tabernacle and temple and their contents.

Of course, in ordinary measurements, the pî proportion is near enough for all practical purposes. But in the distances of the heavenly bodies, where the circle of the zodiacal belt and the orbits of the so-called fixed-stars are to be measured, where a unit is multiplied by myriads of quadrillions, it becomes vastly important that we have not only an exact proportion, but a true scientific method of obtaining it. P begins to vary slightly from pî in the sixth decimal figure, thus:

pî .....3.14159265+
P exactly $\frac{20612}{6561}$; expressed decimally.....3.14159426+

This Parker formula (P) we illustrate by a diagram in a manner so simple as to be within the comprehension of a child. We inscribe the largest possible circle within a square. Then, *as the area of this square is to four times the area of this circle, so is the diameter of any circle to its circumference.*

In calculating areas of circles and sides of squares, it becomes necessary to square and extract roots. So in simplifying our illustration, we will use that remarkably flexible and almost magical number 9, which is easily squared to 81, and the square root of which is so readily perceived to be 3. And we will consider our diagram (*a*) as representing a square with 81 inches to the side. Now, as the circle is the largest possible within this square, the diameter of this circle equals a side of this square. To find the area of a square, we square a side. To find the area of a circle, we multiply the square of radius by $\frac{20612}{6561}$ (P). The area of a circle of 81 inches to the diameter obtained by 3.14159+ (pi) is 5152.9929975+; but as obtained by P, is exactly 5153, without the slightest fraction. Now the area of this square is 6,561 inches, and four times the area of this circle is 5153×4=20,612 inches, Then, as 6,561 is to 20,612, so is the diameter of a circle to its circumference.

Skinner shows that Moses and Solomon and the architect of the Great Pyramid, used these very measures which we have obtained in this simple manner, in the construction of those sacred edifices. The Parker formula 6561 : 20612 may be expressed in a modified form without changing the proportion, by dividing both by 1,000, which gives us 6.561 : 20.612, and then we have, in the second term, the exact number of inches to the cubit measure, used in the construction of those sacred buildings. According to Smith's Bible Dictionary, the holy place of the tabernacle was 20 cubits long, and 10 cubits broad:

20×20.612=412.240 inches.
10×20.612=206.120 inches.

The king's chamber is:

In length, 412.132 inches.
In breadth, 206.061 inches.

These measurements of the holy place of the tabernacle correspond, to within about one-tenth of an inch, with the measurements of the length and breadth of the so-called king's chamber in the Great Pyramid. This is nearer than any two measures of this chamber have ever agreed.

We would ask any who regard it as heterodox to connect science in any way with revelation, to notice the first verse of the first chapter in the Bible, and read the name there, in Hebrew, of that Being, who, "in the beginning created the heavens and the earth," and then tell us, is it likely that that name of His was conferred upon Him by any of His creatures? If so, by whom, and what did it signify? We must remember that the Hebrews had no figures for numbers, and so they used letters in alphabetical order instead. Letters, therefore, often had a double signification. Was it accidental that the numbers signified by the letsers of that name as seen in our diagram *c*, are 3.1415+, the symbol of the quadrature of the circle? If so, is not such an accident more wonderful than the reality? The circle is not completed with the last figure 5, and plus is the only single symbol that can complete either the circle or the symbol, if expressed there decimally. God's law is the transcript of His nature. And here we

have symbols of that law which governed in all the sacred places, whether in art or in nature.

If it is objected that we begin to read these figures not with the beginning of the word, we answer that the word A-l-h-m, of four letters, represents a square. But the numbers which these letters signify, are the acknowledged symbols of a circle. Now, it is in the circle that we read these figures, and what difference does it make where we begin to read on a circle, which has neither beginning nor end, provided we read according to the Hebrew custom, from right to left. Is it not the more significant of the Being who had no beginning?

Further, a circle is the proverbial symbol of fullness or perfection and eternity, as a square is a symbol of rectitude or righteousness and truth, all attributes of Deity himself, while the unchangeable proportions symbolized, is no less suggestive of immutability. No one calls it a coincidence merely, that the symbol of a pyramid is found in the cartouche of a king of the fourth Egyptian dynasty. It is accepted as evidence that Cheops built it. Is it any less conclusive that the Almighty has revealed to man that symbol of modern science which entered into the construction of all the sacred architecture on earth and in heaven, when we find it in the first recorded name of His, ever written by inspiration?

But, happily, we are not left to the necessity of merely theorizing on this subject. That people have been really inspired from above to construct the sacred architecture which contains the symbols in question, is recorded in Revelation as a positive fact. Bezaleel and Aholiab "were filled with the Spirit of God," to enable them to work in all manner of workmanship, pertaining to the construction of what pertained to the tabernacle of Moses. (See Ex. xxxi. 1—11.)

Now, we are willing to concede that there may have been one chance in a million that this was an accident, within the limits of possibility. So, "at the mouth of two or three witnesses, that every word may be established," we will bring forth a second attest. We will examine that specimen of architecture which is acknowledged to be the most sacred of any work of inspired man on earth, called the ark of the covenant, on which nothing was done without Divine direction in the doing of it. The all-essential thing in a covenant is the signature. Did the Almighty have his signature on and in that ark and its contents? We answer, we find the same symbol that we did in his first recorded name, both in the measures and in the name.

First, let us see the measures, 2½ cubits long, 1½ broad, 1½ deep:

2½×20.612 inches=51.53 inches.

1½×1½=3×20.612=61836 in.÷12=5.153 feet.

So, in the denomination of both feet and inches, we find this peculiar group of figures. And, these figures, 5153 in inches, are the area of our circle of 81 inches in diameter. Now, let us examine the word covenant. In Hebrew it is B-r-y-th. Let us place these letters on the corners of a square of 81 inches to the side, and see if the numbers represented are symbolical of our circle, with 81 inches for its diameter? (Diagram *e.*) It is permissible to omit the ciphers. We

begin with 4, and read 41224. There is no fraction this time, and so we go all the way round the circle, to do which requires the repetition of the first figure. Now, a cube has eight sides, and 41224 is exactly eight times 5153. We have shown that four times this number, 20612, was the other factor in the Parker modulus, which is exactly doubled in this word covenant; and this is not without apparent signification, as the coffer of the Pyramid, which corresponds to the ark of the tabernacle, is double in its outside measures to its capacity measures.

Having found this symbol of the quadrature of the circle in the first revealed name of Almighty God, and also in the Sinai or Law Covenant, we will look next to the Abrahamic Covenant, which the law could not disannul. (See Gal. iii. 17.) We place the four Hebrew letters, which spell Abr'm, at the corners of our square of 81 inches; and, when we get the group of figures, 41224, we see that they are the same as in the word Covenant, and in the same order. But we read from over the circle in one word, and from under it in the other. (See diagrams *e* and *f*.) Read that most wonderfully expressive of all groups of figures in those two words, side by side.

The names of Parker and Skinner, who have given us the clue to these marvelous discoveries of pure and applied science in revelation, deserve conspicuous places among modern discoverers. This cubit of 20.612 inches corresponds nearly to an ancient measure found on a papyrus scroll in the Museum of Turin. Skinner calls the Parker modulus "the creative law of Almighty God, by which he mentally conceived the framework of the mighty worlds composing his house, the universe." In fact, he has discovered rules, based on this formula, by which to determine the sun's angle of parallax and distance and the movements of the moon and earth.

We furnish this article for publication by request, not with the expectation of converting very many to our views. "Can there any good come out of Nazareth?" is the old type of response to unanswerable argument pertaining to the transcendental. We are well aware that our "so called proofs" may be easily disposed of as coincidences, curiosities, or accidents. But, nevertheless, the fact cannot be controverted that the figures, carried out with exactness in order and number to four decimals with a plus, and coinciding exactly to those figures which symbolize the quadrature of the circle, are unveiled in the first revealed name of Almighty God, repeated hundreds of times in the Old Testament, where they have been concealed till J. Ralston Skinner (the author of several mathematical works) discovered them. Expressed decimally, these figures agree to exactness with our P modulus.

Nor is it a less important fact, in harmony with the above, and as corroborating the same truth, that the two covenants for which the Old and New Testament Scriptures are named, contain the symbols of the same mathematical problem.

They solve repeatedly what has been declared by scholars to be as impossible as perpetual motion, and place our good old Bible in connection with the

Great Pyramid (which is older) in advance of all other books, in both pure and applied mathematical science, revealed to us in a way older than all written or oral language, in symbols which are eternal and unchangeable, universally intelligible, without interpretation, alike to the child and the philosopher, the savage and the scholar.

The flippant epithets, "coincidences," "curiosities," or "accidents" are not at all responsive to these facts. Like the successive steps in a geometrical theorem, they become, when so often repeated, what lawyers call cumulative evidence, or what mathematicians call self-supporting.

But it is objected that figures are wonderfully flexible, and that the 666 of Revelation was supposed to refer to the Latin church, till it was learned that they would fit several other names. Suppose they do! Does that unfit them for the object designed as descriptive figures? Have they no discoverable application on that account? This is the old objection to the peculiarities of Moses' rod. The description would apply to the magicians' rods. Did not the words Jesus or Christ fit other persons? But this objection is not relevant to this unique case.

For a more elaborate discussion of this and kindred topics (including the relation of the analytical unit (R°) to this square of 81 inches) we refer to our articles on the Great Pyramid and its symbolisms in the *Baptist Family Magazine.*

NOTES AND QUERIES.

Will some of the readers of the REVIEW, who are versed in our early history, inform me if the Missouri river was explored for any distance by *American* travelers prior to the expedition of Lewis & Clark—if so, by whom and the date.

A. C.

When was that part of Missouri, south of the Missouri river, and west of the Osage boundary line, (line from Sibley south to Arkansas river,) vacated by Indians? The Osages vacated that east of this line and relinquished title in 1808. G. C. BROADHEAD.

I have seen a newspaper statement to the effect that the Confederate Government, while in existence, did not possess a seal, and that many of the generals who served under it did so without commission, acting under verbal or written assignments. Is the statement true? ANTIQUARY.

As an evidence of the influence possessed by traders over the Indians formerly inhabiting our state, I will give an incident that occurred among the Osages. About the year 1795, at the instigation of Pierre Chouteau, who had controlled the trade of this tribe for several years, more than two-thirds of them removed from the Osage river to the Arkansas. Chouteau persuaded them to take this step as a revenge on Manuel Lisa, who had obtained from the Spanish authorities the exclusive right to trade on the Osage river. After Louisiana was

ceded to the United State an effort was made to reunite the villages but without success, and later when they ceded their lands to the government they conveyed over twenty millions of acres in the territory of Arkansas. OSAGE.

In Lewis & Clark's Expedition, Vol. 1, p. 17, referring to a stream not far from the Kansas, the following occurs: "To the north are some rocks projecting into the river, and a little beyond them a creek on the same side called Charaton Scarty, that is, Charaton like the Otter."

Can any one tell me the present name of the stream above mentioned? J.

---

1. Is there a work on the geographical distribution of prehistoric remains in America?

2. Who can give me the address of the Secretary of the St. Louis Historical Society?

3. The address of the President of the Archæological Institute of America.

T. L. L.

Lieut. Pike, who was among the Osages in 1806, says: Chtoka, a little Osage chief, informed him that he was at Braddock's defeat with all the warriors that could be spared from both villages; that they were engaged by Mr. McCarty, who commanded at Fort Chartres, and who supplied them with powder and ball; that the general place of rendezvous was near a lake and large fall (probably Niagara). The Kansas Indians did not arrive until after the battle, but the Otoes were present. They were absent from their villages seven months and were obliged to eat their horses while returning. Can any one cite me to a confirmation of this statement that our western Indian participated in that memorable engagement? OSAGE.

The last number of REVIEW asks the origin of the name Chariton. Lewis & Clark spell it Charaton and say it is a corruption of Thieraton, but say nothing more. Some of the old settlers along that river some years ago informed me that it meant "land rich in honey," being famous land for "bee hunters."

The first survey for the North Missouri Railroad was located and road built along what was known as the "bee trace," a beaten path along the dividing ridge between the waters of the Chariton and those flowing toward the Mississippi. The earlier settlers pronounced the name Charataw. G. C. B.

PUBLICATIONS RECEIVED.

The *Platonist*, Vol. I, No. 2, devoted to the dissemination of the Platonic Philosophy in all its phases: quarto, 16 pp., monthly, Thos. M. Johnson,

Osceola, Mo., $2.00: *Student Life*, Vol. IV, No. 7, a sprightly monthly, edited and published by the students of Washington University, St. Louis, Mo., $1.50: The *Baptist Monthly Magazine*, Vol. II, No. 4, 32 pp. oct., monthly, Philadelphia, $1.00 per annum: Notes on the Crania of New England Indians, by Lucien Carr, published by the Boston Society of Natural History, 1880: Thirty-seventh Annual Report of the New York Association for Improving the Condition of the Poor, 1880: Fifty-third Annual Report of the Ohio Mechanics Institute, 1881: Population and Resources of Alaska, by Ivan Petroff, special agent of the Treasury Department, 1881: The Red Spot on Jupiter, by Prof. H. S. Pritchett, from Proceedings A. A. A. S., Boston, 1880: The Physical Basis of Life, by Prof. T. H. Huxley, Humboldt Library, Vol. I, No. 21, J. Fitzgerald & Co., N.Y., 15c: The *Illustrated Cosmos*, Chicago, Ill., Vol. I, No. 3: The New York School Examination Questions, C. W. Bardeen, Syracuse, N. Y., 25c: The Causes which Produce the Prevailing Winds and Ocean Currents, by C. A. M. Taber, Boston, 1881.

THE TRANSPORTATION OF WHEAT.

The cost per bushel of bringing wheat from the great centers of production and distribution to the leading markets of Europe has been elaborately compared and tabulated as follows by Mr. R. Meyer, in the *Austrian Monthly of Social Science and Political Economy*:

From	To	
San Francisco	England	$0.36@$0.39
The "Far West"	Atlantic Harbor	40
New York	Liverpool	10
Chicago	Liverpool	19
Bombay	England	13
Calcutta	England *via* Suez	18@ 29
Calcutta	England *via* Cape	15@ 20
Australia	England	21
Buenos Ayres	Havre	16@ 20
Odessa	England or Antwerp	13@ 22
Podwolocziska	Delhi	44
Brody	Delhi	42
Brody	Hamburg	39
Ibraila	London	18
Galacz	Hamburg	57
Budapest	Hamburg	31
Budapest	Liverpool *via* Fiume	28
Lemberg	Frankfort-on-the-Main	26
Vienna	Frankfort-on-the-Main	24
Vienna	Fiume	21
Vienna	Trieste	21

From Odessa is shipped the wheat of Southern Russia. Brody, in Northern Galicia, collects the wheat of the upper valleys of the rivers of Southwestern Russia. Lemberg, close by, is the capital of Galicia. Ibraila is the shipping

point of Wallachia. Galacz ships the wheat of the upper valley of the Danube. Budapest is the central point of Hungary, as Vienna is of Austria. It costs nearly as much to carry wheat from Brody to Lemberg, 58 miles (no railway), as it does from Chicago to Liverpool. From Vienna to Trieste is about 250 miles by rail; in cost of transportation it is further than from Calcutta to England around the Cape. California can easily compete with Hungary in the markets of Western Europe, the cost of raising the wheat being the same.

THE MASTODON IN RECENT TIMES.

Prof John Collett, Ph. D., state geologist of Indiana, gives some statistics in relation to the Mastodon, that dispels the notion that these animals did not live in recent times. Archæologists who argue the great antiquity of man upon this planet, based upon the fact that his remains have been found with those of the Mastodon, will be compelled to seek other lines of proof for their theory. We quote from page 385, geological report for 1880. Prof. Collett says:

Of the thirty individual specimens of the remains of the Mastodon (*Mastodon giganteus*) found in this state, in almost every case a very considerable part of the skeleton of each animal proved to be in a greater of less condition of decay. The remains have always been discovered in marshes, ponds or other miry places, indicating, at once, the cause of the death of the animal and the reason of the preservation of the bones from decay. Spots of ground in this condition, are found at the summit of the glacial drift or in "old beds" of rivers which have adopted a shorter route and lower level, consequently their date does not reach beyond the most recent changes of the earth's surface; in fact, their existence was so late that the only query is, why did they become extinct?

A skeleton was discovered in excavating the bed of the canal a few miles north of Covington, Fountain county, bedded in wet peat. The teeth were in good preservation, and Mr. Perrin Kent states that when the larger bones were cut open the marrow, still preserved, was utilized by the bog cutters to "grease" their boots, and that chunks of sperm-like substance 2½ to 3 inches in diameter (adipocere) occupied the place of the kidney fat of the monster. During the past summer of 1880 an almost complete skeleton of a mastodon was found six miles northwest from Hoopston, Iriquois Co., Ill., which goes far to settle definitely that it was not only a recent animal, but that it survived until the life and vegetation of to-day prevailed. The tusks formed each a full quarter of a circle, were nine feet long, twenty-two inches in circumference at the base, and in their water-soaked condition weighed 175 pounds. The lower jaw was well-preserved with a full set of magnificent teeth, and is nearly three feet long. The teeth, as usual, were thickly enameled, and weighed each from four to five pounds. The leg bones, when joined at the knee, made a total length of five and a half feet, indicating that the animal was no less than eleven feet high, and from fifteen to sixteen feet from brow to rump. On inspecting the remains closely, a mass of fi-

XUM

brous, bark-like material was found between the ribs, filling the place of the animals stomach; when carefully separated, it proved to be a crushed mass of herbs and grasses, similar to those which still grow in the vicinity. In the same bed of miry clay a multitude of small fresh water and land shells were observed and collected, which were kindly determined by Dr. F. Stein, as follows:

1. *Pisidium*, closely resembling *P. abditum* Halderman. 2. *Valvata tricarinata* Say. 3. *Valvata*, resembling *V. striata*. 4. *Planorbis parvus* Say.

The shell bearing animals prevail all over the States of Illinois, Indiana and parts of Michigan, and show conclusively that however other conditions may differ, that the animal and vegetable life, and consequently climate, are the same now as when this mastodon sunk in his grave of mire and clay.—*Clinton (Wis.) Herald.*

A TEN-INCH RAILWAY.

One of the most curious railways in the world is the ten-inch gauge road running from North Billerica, Massachusetts, to Bedford. It was at first hooted at by the people, but the road was completed, making a length of about eight and a half miles. There are eleven bridges on the road, one of which is over 100 feet long. The rails weigh 25 pounds to the yard. The road is well built and equipped—one grade is 155 feet. The cars and engines will at first sight create wonder and admiration. Their perfect proportions give them a handsome appearance. They are constructed very near the ground, giving them great advantages of safety. The cars have an aisle with one seat on each side, in the same manner as our ordinary cars have two seats. The length of the cars allows thrity seats, each person having a seat to himself. The cars are supplied with closets, water tank, and heated by steam, and have all the modern improvements. They weigh but four and a half tons, ordinary cars weighing on a average eighteen tons. The trains run at the rate of twenty miles an hour, with perfect safety. The engine is placed behind the tender, giving greater adhesion to the track. They weigh eight tons, and draw two passenger and two baggage cars. The cost of the road was about $4,500 per mile.

PROTOPLASM—NOT AN ULTIMATE SUBSTANCE.

H. J. Reinke (*Botan. Zeitung*, 38, No. 48) has examined protoplasm obtained from *Æthalium septicum*, and discovered in it the following proximate constituents: Plastin (an insoluble albuminoid resembling the fibrins), vitellin, myosin pepton, peptonoid, pepsin, nuclein, lecithin, guanin, sarcin, xanthin, ammonium carbonate, paracholesterin, traces of cholesterin, Æthalium resin, a yellow pigment, glycogen, sugar (non-reductive), oleic, stearic, palmitic, and traces of butyric acids, carbonic acid, fatty glycerides and paracholesterides, calcium stearate, palmitate, oleate, lactate, oxalate, acetate, formiate, phosphate, carbonate.

XUM

sulphate (traces), magnesium (probably phosphate), potassium phosphate, sodium chloride, iron (compound not determined), and water. Plastin can be separated by pressure from the liquid portions of protoplasm. The albuminoids collectively scarcely amount to 30 per cent of the dry substance. Hence the supposition that protoplasm consists of albumen must be abandoned, and we must cease to compare a plasma cell with a particle of white of egg.—*Scientific American.*

THE BLACK RACES OF OCEANICA.

Negro forms are figured among the earliest representations of men on an cient monuments. As early as the eighteenth dynasty (seventeen hundred years before the Christian era), the artists of Egypt represented at least five races of negroes. Nigritic types were also figured by the Greeks, Romans, Assyrians, Babylonians and Persians, although none of these people had as extended knowledge of Africa as the Egyptians had. The examination of all the monuments which have come down from antiquity makes it evident that the negro races of Africa and Asia were well known. Scientific investigations of negro characteristics began to be made in the sixteenth century. The first to record one was Albert Durer, who, in 1525, drew a profile of a negro inclosed in a system of lines, of which an oblique and a horizontal line formed at their junction a real facial angle. MM. de Quatrefages and Hamy, in their "Crania Ethnica," begin the study of the negro races with the negroes of Oceanica, and select as their point of departure the Negritos, the most brachycephalic race. The Negrito race proper, which was first observed in the Philippine Islands, has been found in the interior of the Peninsula of Malacca, the Sunda Islands, and the Andaman Islands. M. Hamy has been able to trace it even to the interior of India.—*Dr. Verneau, in Popular Science Monthly.*

GYMNASTICS AS A CURE OF DISEASE.

Physical vigor is the basis of all moral and bodily welfare, and a chief condition of permanent health. Like manly strength and female purity, gymnastics and temperance should go hand in hand. An effeminate man is half sick; without the stimulus of physical exercise, the complex organism of the human body is liable to disorders which abstinence and chastity can only partly counteract. By increasing the action of the circulatory system, athletic sports promote the elimination of effete matter and quicken all the vital processes till languor and dyspepsia disappear like rust from a busy plowshare. "When I reflect on the immunity of hard-working people from the effects of wrong and over-feeding," says Dr. Boerhaave, "I cannot help thinking that most of our fashionable diseases might be cured *mechanicaily instead of chemically*, by climbing a bitterwood tree or chopping it down, if you like, rather than swallowing a decoction of its disgusting leaves."

The medical philosopher, Asclepiades, Pliny tells us, had found that health could be preserved, and if lost, restored, by physical exercise alone, and not only discarded the use of internal remedies, but made public declaration that he would forfeit all claim to the title of a physician if he should ever fall sick or die but by violence or extreme old age. Asclepiades kept his word, for he lived upward of a century and died from the effects of an accident. He used to prescribe a course of gymnastics for every form of bodily ailment, and the same physic might be successfully applied to certain moral disorders, incontinence, for instance, and the incipient stages of the alcohol habit. It would be a remedy *ad principium*, curing the symptoms by removing the cause, for some of the besetting vices of youth can with certainty be ascribed to an excess of that potential energy which finds no outlet in the functions of our sedentary mode of life. In large cities parents owe their children a provision for a frequent opportunity of active exercise, as they owe them antiseptic diet in a malarious climate.—By DR. FELIX L. OSWALD, *in Popular Science Monthly for May.*

Trouve's utilization of electricity in combination with surgical instruments is bearing fruit. A case is reported from Vienna in which a doctor has succeeded in curing a cancer in the stomach mainly through the assistance rendered by the polyscope in illuminating the cavity of the stomach. The electric probe, which rings a bell when a ball or any metallic substance imbedded in the muscle is reached, is found a valuable acquisition by army surgeons, and an application of the same principle to surgical forceps has enabled a Berlin oculist to save a mechanic's eye, which had received a bit of steel. The case had become so urgent that the eye must be lost unless the piece of metal could be extracted without delay, but Dr. Hirshberg, by inserting a soft iron probe and subsequently converting it into a magnet by passing an electric current through it, withdrew the metallic particle, and saved the eye.

A curious experiment in heat is performed with an apparatus devised by Dr. Grassi. The apparatus consists of three concentric vessels separated by annular spaces about three-fourths of an inch. The outer space is filled with oil, and the inner with water. The oil is heated to a point above 212° Fahrenheit, when the water begins to boil. Oil heated to 300° is then introduced into the central vessel, and falls rapidly to a temperature about that of the boiling water. Dr. Grassi finds that this central oil cools the more quickly the greater the heat of the outer ring of oil—a result seemingly very paradoxical.

EDITORIAL NOTES.

THE paper read by Dr. Halley before the Kansas City Academy of Science at its April meeting, on Good Drinking Water, was a carefully prepared and exhaustive *resumè* of the whole subject, and the suggestions made were eminently practical and appropriate. At the next meeting, Gen. Samuel Bowman will deliver the 5th Anniversary Address and the new officers will be elected.

PROF. SNOW lectured at Chanute last week upon the Mound Builders, and the next day led a small party in opening two mounds near that city.

PROF. O. ST. JOHN has just returned from a short trip to Arizona and Sonora. He says that a complete skeleton of a Mastodon is reported some thirty miles south from Dodge. A small party led by Prof. Lovewell is about to go down and explore the locality for the same.

THE Missouri river, for the past month, has been exceedingly high. The cities of Omaha, St. Joseph and Leavenworth, and many smaller places have been severely damaged. At this place, so far, (April 28,) the river has not overflowed its banks, although Harlem, on the opposite side, is completely submerged, and the water is twenty-three feet and six inches above low water mark by the city directrix: higher than at any time since 1844, when it exceeded the present height by about twelve feet.

LATER.—On April 29th the river overflowed its banks and to-day, the 30th, the water stands at 27.5 feet above low water mark by the government directrix, or 25.5 by the city directrix. Several ice houses have been destroyed and all railroad trains east and north are stopped. No serious damage to life or property, and it is believed that the maximum height has been attained.

IT is proposed to put iron stairways on the outside of the school houses in Baltimore, that are now supplied with but one single stairway within the building. The city has appropriated $10,000 to furnish additional means of egress from such buildings.

COL. HENRY INMAN, of Kansas, has just published a series of sketches of wild western life and adventure, under the title of Stories of The Old Santa Fe Trail, which make up an attractive volume of some three hundred pages. This work will doubtless find a ready sale, as it is written in a vigorous and brilliant style, and comprises many legends and tales in which the western people have a personal interest, while, to the traveler passing across the plains, it will serve both as a guide book and a romance.

WE are indebted to Prof. Lovewell, of Washburn College, Topeka, for an advance copy of the Transactions of the Kansas Academy of Science, 12th and 13th Annual Meetings. It is well arranged and contains many valuable contributions to science. We shall give it an extended notice next month.

IT IS reported that the renowned astronomer, Prof. R. A. Proctor, is to be married at St. Joseph, Mo., during the present month, to a widow named Mrs. Crawley. The recent conjunctions among the heavenly bodies are evidently suggestive to his astronomical mind.

PROBABLY the most acute and exhaustive study ever made of "Demosthenes and Political Eloquence in Greece," is that of Prof. L. Bredif, of the University of France, at Paris. It is at once subtle, comprehensive, and fascinating as the best novel. S. C. Griggs & Co., Chicago, announce for immediate issue a translation of this remarkable

work by Prof. M. J. McMahon, who is, also, an accomplished scholar in both ancient and modern tongues.

PROFESSORS Trowbridge and Smith, both well known to the readers of the REVIEW by their contributions to it, announce a Summer School of Science at Pritchett Institute, Glasgow, Mo., to commence June 20th, and continue five weeks.

PROFESSOR Wm. I. Marshall, of Fitchburg, Mass., who will be remembered by our citizens from his very entertaining lecture upon "The National Park and its Wonders," under the auspices of the Kansas City Academy of Science, has arranged to conduct an excursion party of prominent teachers and scientists to and through that remarkable region this summer, between August 1st and Sep. 5th. Those giving a month to this excursion under Prof. Marshall's leadership, will be most abundantly repaid.

THE Boston Society of Natural History announces that a Sea-side Laboratory, under the direction of the Curator and capable of accommodating a limited number of students, will be open at Annisquam, Mass., from June 5th to Sept. 15th, the object being to afford opportunities for the study and observation of the development, anatomy and habits of common types of marine animals under suitable direction and advice. There will be no attempt, however, to give any stated course of instruction or lectures.

HENRY B. DAWSON, editor of the *Historical Magazine*, gives the REVIEW the following notice in a private lette:

DEAR SIR:—I have received the January 1881, number of your REVIEW, which I have spent an afternoon in examining; and I am very much pleased with it. I fear it is too good to be "popular," and that it does not pay.

THE British government has recently ordered from the Brush Company of Cleveland, Ohio, an electric light for use in the navy, of 100,000 candle illuminating power. It is believed to be the most powerful light ever made by human hands.

AT the meeting of the St. Louis Academy of Science April 4, Dr. Stephens reported upon his examintion of the famous fragments of matter, supposed to be human bones, which were found by Dr. R. W. Boothe in a mine sixty miles from there, at a greater depth than human remains were ever found before, in a deposit of iron. He expressed a decided opinion that there was nothing in the structure of the fragments to demonstrate that they were bones, and he was positive they were of vegetable growth.

PROF. H. S. SHORT, of the Denver University, is said to have made two very important discoveries in electrical illumination: first, that a film of chromium can be made with the best conductive capacity and practically indestructible; second, that the film may be heated by the electric current to the most brilliant incandescence in a globe filled with hydrogen gas, without injury to either the chromium or the gas, thus overcoming the chief difficulties with which Edison is contending.

THE extensive works of the Kansas City Smelting and Refining Company will be ready to commence operations June 1st.

THE revenue steamer Corwin is to make another cruise in the Arctic seas in search of the Jeanette expedition. The regular relief expedition provided for by congress will go to the West after passing through Behring's strait. The Corwin will go to the East and search the region about Point Barrow.

MR. RAMON VEREA, a Spanish resident of New York, has been devoting his leisure hours for several years in developing a machine that will multiply and divide, and it is said, has finally succeeded.

THE naval officers composing the Jeanette relief board have completed their work and submitted their report to the Secretary of the Navy. The report recommends that the Mary and Helen should leave San Francisco about June 1, to arrive at Herald Island by the middle of August, and examine the coast

of Siberia. The steamer should winter at some harbor on the southern or southeastern end of Wrangels Land or on the Siberian coast as near as possible to Wrangels Land, so as to make the sledge journeys to the east coast of Wrangels Land. They should not remain in the Arctic more than one winter.

The report closes with an expression of belief that the Jeanette should be considered safe until news of disaster is received.

A SCOTTISH scientist has discovered in the course of his investigations that there was an industry pursued in the north of Scotland that was, in its elements, as ancient as that of the potters of Etruria. In a small district he found that certain pottery—vessels known as kraggans—were still being manufactured, and an old woman who stated that she had inherited the art from ancestors buried long years ago, made the old-fashioned vessels. They were all perfect, and the surrounding peasantry looked upon their maker with considerable reverence. The molding was done with a peculiarly bent stick, and not with any instrument like the potter's wheel.

ITEMS FROM THE PERIODICALS.

THE Leavenworth *Standard* has published several articles describing certain lately discovered remains of ancient earthworks near the Fort and is of the opinion that they are on the site of the battle fought between the Spaniards and the Missouris in 1719, described by Mr. John P. Jones in the last number of the REVIEW. Further investigations are being made by competent and enthusiastic gentlemen, such as Judge Adams of Topeka, Dr. A. J. Brown and Judge Mann of Leavenworth, the result of whose labors we shall present to our readers as soon as it assumes a reliable form.

THE New York Entomological Club has commenced the publication of an organ with the title *Papilio*, to be issued on the 15th of every month and devoted solely to the Lepidoptera. $2 00 per annum.

THE *Illustrated Cosmos*, edited and published by Everett W. Fish at Chicago is "designed to represent the relation of the living church to the great questions developed by modern physics and philosophy." It is a handsome quarto, well illustrated, and issued monthly at the price of $1.50 per annum.

THE Telectroscope is an apparatus intended to transmit to a distance over telegraphic wires pictures taken on the plate of a camera. It was invented by M. Selencq, of Ardres, in 1877, and has been perfected. A very full description of it is given in the *Scientific American Supplement* for April 9, 1881.

THE *Atlantic Monthly* for May, 1881, presents the following attractive table of contents: "Some Personal Recollections of Carlyle, Henry James; Rabbi Ishmael, John Greenleaf Whittier; The Martrydom of an Empire, E. H. House; The Portrait of a Lady, XXV.-XXVIII, Henry James, Jr.; Three Sonnets, I. Nativity, II. Circumstances, III. Providence, J. T. Trowbridge; Study of an Old Southern Borough, Walter H. Page; Reminiscences of Washington, XII, The Fillmore Administration, 1859-1853; Friends: A Duet, XI.-XII., Elizabeth Stuart Phelps; Eugene Scribe, J. Brander Matthews; Lawn Planting for Winter Effect, Samuel Parsons, Jr.; Demeter's Search, Edith Thomas; Correspondence With a British Critic, Richard Grant White; The Head of Medusa, and other novels; The new edition of Gilchrist's Blake; The Contributor's Club; Books of the month."

FROM the many interesting articles in the May *Harper*, we select as most appropriate and seasonable, those on George Eliot, Thomas Carlyle and others, Athens and the Greeks of To-day, and MacCook's Camp Lou.

THE *Independent Practitioner* is a monthly journal, devoted to medical, surgical, obstretical, dental, hygienical and popular science, edited by Harvey L. Byrd, A. M., M. D., and Basil M. Wilkerson, D. D. S., M. D., No. 68 North Charles street. Subscription, $3.00 per annum, in advance.